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COMMERCIAL FISHERIES REVIEW

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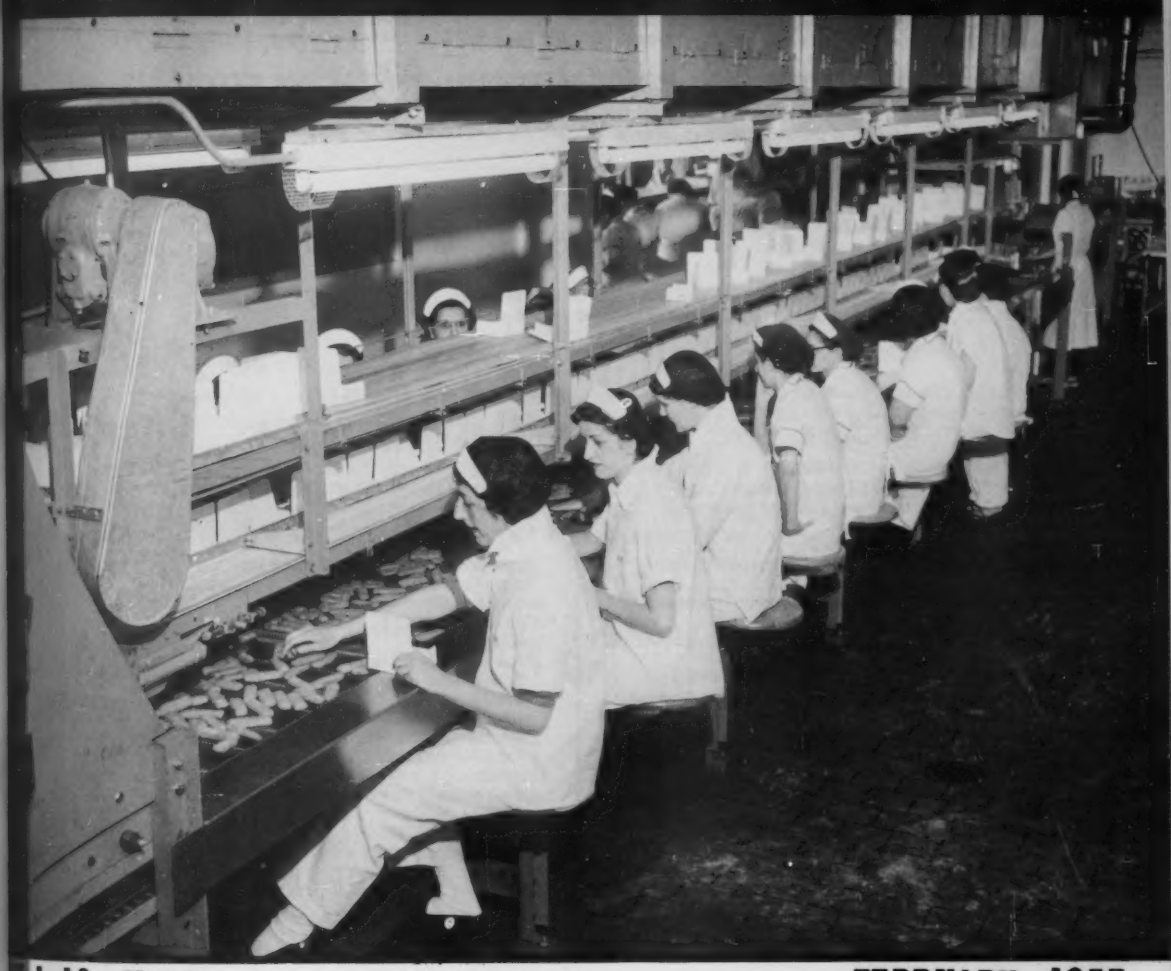

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FISH AND WILDLIFE SERVICE

COMMERCIAL FISHERIES REVIEW

A review of developments and news of the fishery industries
prepared in the BRANCH OF COMMERCIAL FISHERIES

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SOME FACTORS AFFECTING "SAWDUST" LOSSES DURING THE CUTTING OF FISH STICKS

By F. J. Cocca*

ABSTRACT

Much fish is lost as "sawdust" in the cutting of fish sticks (a three-step operation). As the result of a study to reduce this loss by making the bandsaw blade more efficient, an "ideal" blade was designed. The loss of sawdust with this blade was significantly less than that with the blades that are regularly used. The data obtained in this study show the great importance of using a slicing operation rather than a sawing operation in the third step.

INTRODUCTION

Fish sticks are cut from frozen blocks of boneless and skinless fillets that have been compressed and frozen into a uniform rectangular shape. Although the sizes and shapes of the many fish blocks on the market vary considerably, the dimensions are such that, ordinarily, each properly-prepared block will produce a definite number of uniform sticks with a minumum amount of the block being lost as scrap. Even with perfect blocks, however, there is a considerable loss of "sawdust" when cutting the fish sticks. This loss ranges from 7 to 12 percent of the weight of the block.

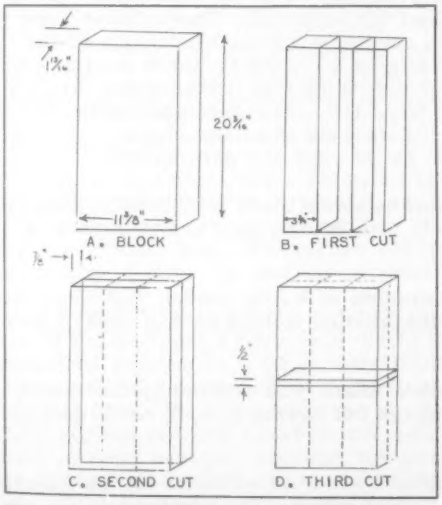

Fig. 1 - Steps in cutting fish sticks from fish blocks.

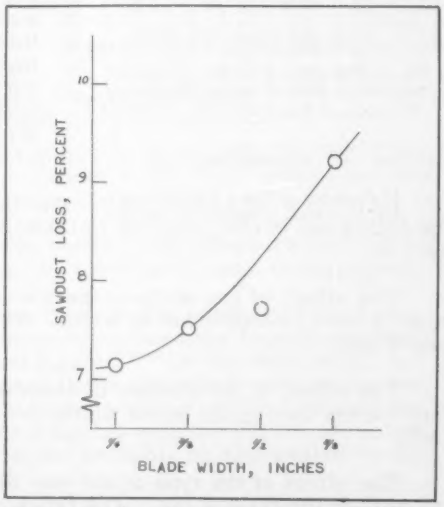

Fig. 2 - The effect of bandsaw widths on sawdust loss during the cutting of fish sticks from fish blocks.

Because the sawdust is not used in preparing fish sticks or for preparing other human food, it represents a considerable loss to the industry. The significance of this loss can be realized when the total importation of fish blocks is considered.

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In 1955 a total of 48.2 million pounds of frozen fish blocks were imported into this country (domestic fish block production is not included in these figures). Assuming that sawing is the only method of cutting used and that the average loss of sawdust is 10 percent of the weight of the block, this loss would amount to 4.8 million pounds of fish fillets.

Fish sticks are cut from frozen fish-fillet blocks by two methods: (1) by the use of a group of bandsaws and (2) by the use of a combination of bandsaws and of guillotine cutting knives. The bandsaw blades that are used vary considerably in type and size.

Observations of commercial fish-stick cutting operations indicated that the characteristics of the bandsaw blade affected the amount of sawdust that was lost. A series of tests therefore was carried out at the Service's Fishery Technological Laboratory in East Boston to determine the effect of the type of blade on the loss of sawdust in the bandsaw cutting operations. The variables that were studied are the following: (1) width of blade, (2) number of teeth per inch, (3) type of set, (4) gauge (thickness), and (5) degree of set.

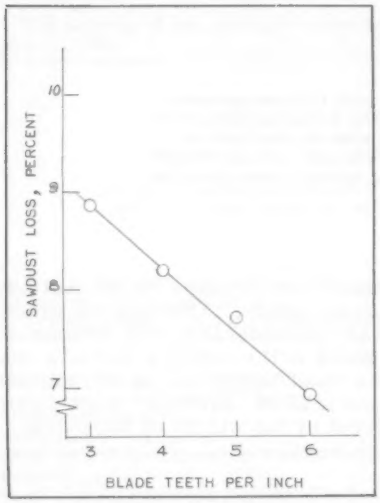

Fig. 3 - The effect of number of teeth per inch of saw blade on sawdust loss during the cutting of fish sticks from fish blocks.

EXPERIMENTAL PROCEDURE

CUTTING OF BLOCKS: The fish blocks used in this study were $20\frac{3}{16}$ inches in depth (fig. 1A). This block produced 216 whole fish sticks, each of which were $3\frac{3}{4}$ inches in length, $\frac{7}{8}$ inch in width, and $\frac{1}{2}$ inch in thickness.

In the production of the fish sticks, the blocks first were cut into three $3\frac{3}{4}$-inch sections on the $11\frac{3}{8}$-inch side (fig. 1B)--$\frac{1}{16}$ inch loss of sawdust was allowed for each cut. These three slabs then were cut into six $\frac{7}{8}$-inch sections on the $1\frac{13}{16}$-inch side (fig. 10). Finally, these sections were cut into $\frac{1}{2}$-inch-thick fish sticks along the $20\frac{3}{16}$-inch side (fig. 1D). The sections, slabs, and fish sticks were weighed after the respective cuts and the corresponding loss of weight for each set of cuts was determined.

BANDSAW BLADES USED: The individual bandsaw blade is characterized by the following: width, number of teeth per inch, type of set, gauge, and degree of set.

The effect of the width of the blade was studied with four blades that were identical in every respect but in width. The widths studied were $\frac{1}{4}$ inch, $\frac{3}{8}$ inch, $\frac{1}{2}$ inch, and $\frac{5}{8}$ inch.

The effect of the number of teeth per inch of blade was studied by the use of four blades having the same width, set, and gauge but having 3, 4, 5, or 6 teeth per inch.

The effect of the type of set was determined by the use of three blades differing only in the type of set. The types of set investigated were regular set, 1/ every-tooth set, 2/ and no set. In all of the experiments in which the teeth were set, the

1/ A repeating series in which one tooth is bent to the right of the body of the blade, the next tooth is bent to the left, and the third tooth is not bent (fig. 6).

2/ A repeating series in which one tooth is bent to the right and the next is bent to the left.

bandsaws were set 0.007 inch on each side, making a total degree of set of 0.014 inch and, because the blades had a gauge of 0.025 inch, an "effective thickness" 3/ of 0.039 inch.

The effect of the gauge of the blade on the loss of sawdust was studied by the use of four bandsaw blades that differed only in thickness. The gauges studied were 0.020 inch, 0.025 inch, 0.028 inch, and 0.032 inch.

The effect of the degree of set was studied by the use of three bandsaw blades differing only in the degree of set. All of the blades had the same gauge of 0.025 inch. The blades had a total set of 0.006, 0.014, or 0.022 inch and thus an "effective thickness" of 0.031, 0.039, or 0.047 inch, respectively.

Because the bandsaw is a sensitive tool, the manufacturer had difficulty in making the bandsaw blades to the exact specifications. Consequently, unavoidable variation introduced a slight uncertainty in the results. Nevertheless, the data give a good indication of the general variations in the loss of sawdust that may be expected with each kind of blade.

DISCUSSION OF RESULTS

EFFECT OF WIDTH: The effect of the width of the blade in causing loss of sawdust is shown in table 1 and figure 2. Within the range used, the wider the blade

Table 1 - Effect of the Characteristics of the Bandsaw Blade on the Loss of Sawdust During the Cutting of Fish Sticks From Fillet Blocks

Blade Characteristics Under Test	Description of the Blades					Original Weight of Block	Cutting Losses 1/							
	Width	Teeth Per Inch	Type of Set 2/	Gauge	Effective Thickness 3/		First Cut		Second Cut		Third Cut		Total	
	Inch			Inch	Inch	Grams	Grams	Percent 4/	Grams	Percent 4/	Grams	Percent 4/	Grams	Percent 4/
Effect of width of blade	1/4	5	ETS	0.025	0.039	6232	31	0.50	107	1.72	307	4.92	445	7.14
	3/8	5	ETS	0.025	0.039	5932	32	0.54	112	1.89	302	5.10	446	7.52
	1/2	5	ETS	0.025	0.039	6096	33	0.54	117	1.92	321	5.27	471	7.73
	3/4	5	ETS	0.025	0.039	5822	38	0.66	144	2.48	358	6.14	540	9.28
Effect of number of teeth per inch of blade	1/2	3	ETS	0.025	0.039	6048	37	0.61	137	2.27	362	5.98	536	8.86
		4	ETS	0.025	0.039	5980	34	0.57	127	2.13	329	5.51	490	8.20
		5	ETS	0.025	0.039	6096	33	0.54	117	1.92	321	5.27	471	7.73
		6	ETS	0.025	0.039	5894	27	0.45	106	1.80	276	4.68	409	6.94
Effect of type of set 5/	1/2	4	ETS	0.025	0.039	5980	34	0.57	127	2.13	329	5.51	490	8.20
		4	REG	0.025	0.039	5979	35	0.58	134	2.25	323	5.40	492	8.23
Effect of gauge of blade	1/2	4	ETS	0.020	0.034	5858	32	0.55	112	1.91	283	4.85	427	7.30
		4	ETS	0.025	0.039	5980	34	0.57	127	2.13	329	5.51	490	8.20
		4	ETS	0.028	0.042	5881	36	0.62	141	2.39	347	5.89	524	8.91
		4	ETS	0.032	0.046	5866	42	0.72	155	2.64	389	6.62	586	9.98
Effect of degree of blade	1/2	4	ETS	0.025	0.031	5982	32	0.53	120	2.01	316	5.28	468	7.82
		4	ETS	0.025	0.039	5980	34	0.57	127	2.13	329	5.51	490	8.20
		4	ETS	0.025	0.047	6034	34	0.56	136	2.28	354	5.87	524	8.69
"Ideal" blade	1/2	6	REG	0.020	0.034	5948	26	0.44	103	1.74	254	4.27	383	6.44

1/ Averages of three replicate samples.
2/ ETS: Every tooth set; A repeating series in which one tooth is bent to the right and the next is bent to the left.
REG: Regular set; A repeating series in which one tooth is bent to the right, the next tooth is bent to the left and the third tooth is not bent.
3/ Effective thickness is the thickness of the blade plus the total set.
4/ Expressed as percent of the original block.
5/ A blade with no set was tested, but it proved completely unsatisfactory.

the greater was this loss. Thus, a blade of minimum width would reduce the loss of sawdust substantially. A practical limit, however, is placed on the possible decrease of width because a blade that is too narrow reduces the efficiency of the cutting operation. Also, the narrow blade ($\frac{1}{4}$ inch) bends under pressure causing nonuniformity of the cuts, and the probability that the blade will break is increased.

EFFECT OF NUMBER OF TEETH: An increase in the number of teeth per inch of blade (from 3 teeth to 6 teeth) progressively reduced the loss of sawdust from 8.86 percent to 6.94 percent (table 1 and figure 3). On the other hand, increases in the number of teeth per inch resulted in progressively increasing the clogging of the blade because the sawdust could not be removed efficiently by the small gullets (spaces between the teeth). The clogging with the blades used, however, was not serious, although the problem would probably be aggravated by the use of blades containing more teeth per inch.

EFFECT OF TYPE OF SET: The loss of sawdust that was incurred by a blade having a regular set was 8.23 percent, and the loss that was incurred by a blade

3/ "Effective thickness" is the thickness of the blade plus the total set.

having an every-tooth set was 8.20 percent. Theoretically, the loss of sawdust obtained from each blade should be the same because the gauge and "effective thickness" (a function of gauge and degree of set) on both blades was the same. In agreement with theory, the small difference (8.23 percent versus 8.20 percent) found in the experiment was not significant.

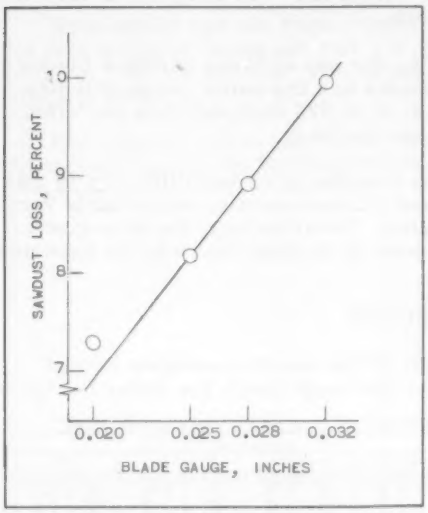

Fig. 4 - The effect of bandsaw gauge on sawdust loss during the cutting of fish sticks from fish blocks.

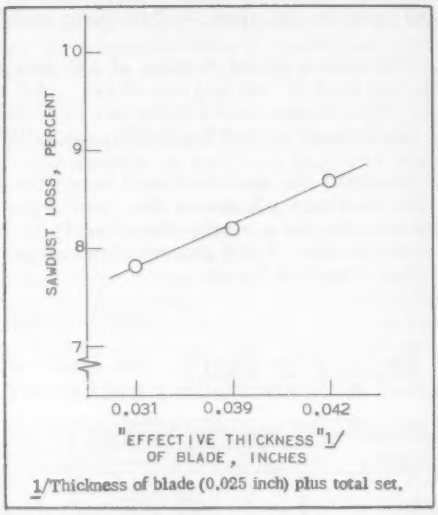

Fig. 5 - The effect of set of a bandsaw on dust during the cutting of fish sticks from fish blocks.

A bandsaw having no set was tested. The blade did not cut rapidly or satisfactorily. The sawdust formed became clogged between the blade and the surface of the meat; this clogging caused the blade to bend, resulting in a curved cut. A set in the blade is necessary, therefore, to prevent the accumulation of sawdust, to permit the blade to pass freely through the material being cut, and to prevent the cut from being curved.

EFFECT OF GAUGE OF BLADE: An increase in the thickness of the bandsaw blade from 0.020 inch to 0.032 inch caused a progressive increase of sawdust loss from 7.30 percent to 9.98 percent (table 1 and fig. 4). Using a blade of minimum thickness therefore would reduce the loss of sawdust.

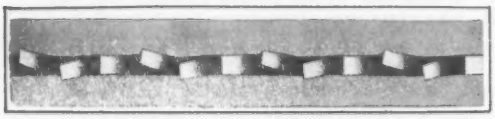

Fig. 6 - Regular set of bandsaw blade.

EFFECT OF DEGREE OF SET: An increase in total set (from 0.006 inch to 0.022 inch) caused a stepwise increase in the loss of sawdust from 7.82 percent to 8.69 percent (table 1 and fig. 5).

"IDEAL" SAW BLADE: After these factors had been considered, an "ideal" bandsaw blade was designed which was thought would decrease the loss of sawdust about as much as is possible. The blade that was chosen had the following characteristics: $\frac{3}{8}$ inch in width, 6 teeth per inch, regular set, 0.020-inch gauge, and 0.007-inch degree of set. The $\frac{3}{8}$-inch blade was chosen instead of a $\frac{1}{4}$-inch blade because the former held up much better under operating conditions than did the latter. The $\frac{3}{8}$-inch blade functioned about as well, however, as did a $\frac{1}{2}$-inch blade. A blade with 6 teeth per inch was selected despite the fact that a greater number

of teeth per inch tended to clog the blade with sawdust; however, given a regular set instead of an every-tooth set, the blade did remove the sawdust rapidly enough. Regular set was chosen because a blade with such a set cut more rapidly than did a blade with an every-tooth set. The 0.007-inch degree of set was selected instead of the 0.003-inch degree of set because it was believed that the latter did not have enough set to operate satisfactorily.

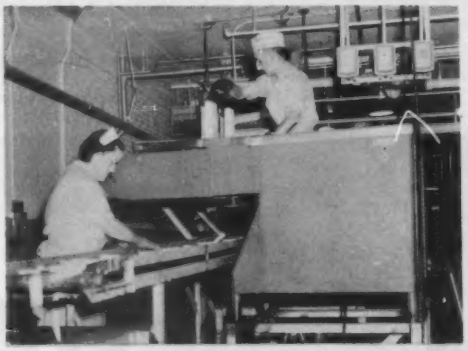

Fig. 7 - Frozen fish slabs fed into the guillotine cutter are sliced into individual fish sticks, which drop on to the conveyor belt for processing.

The 6.44-percent loss of sawdust incurred by the "ideal" blade (table 1) was 7.21 percent less than that incurred by the regularly-used blade having the least loss of sawdust and was 35.4 percent less than that incurred by the regularly-used blade having the most loss of sawdust.

EFFECT OF THE VARIOUS PHASES OF CUTTING: The relative importance of each cut, in terms of loss of fish for each of the various types of blades, may also be observed in table 1. The first cut (fig. 1B), which passed through a relatively small length-depth area of the block, in all cases caused a relatively small loss in weight (0.45 to 0.72 percent). The second cut (fig. 1C), which passed through the large length-width area, caused a noticeably greater loss in weight (1.72 to 2.64 percent). The third cut (fig. 1D), which passed through the relatively small-depth-width area, caused the greatest loss of all (4.68 to 6.62 percent) because of the large number of cuts made when each of the six slabs formed by the previous two cuts were sawed into thirty-six $\frac{1}{2}$-inch fish sticks (making 216 fish sticks in all). These data show the great importance of using a slicing or nonsawdust-forming cutting operation in the third step (fig. 7).

SUMMARY

Fish sticks are cut from frozen blocks of fillets in a three-step operation that results in the loss of 7 to 12 percent of the weight of the block as "sawdust." To help to minimize this loss, the Fishery Technological Laboratory at East Boston carried out a series of tests to determine the effect of the type of bandsaw blade on the loss of sawdust in the bandsaw cutting operations.

Increases in width, in thickness, and in degree of set of the bandsaw blades caused the amount of fish that was lost as sawdust to increase. An increase in the number of teeth per inch of blade caused the amount of fish that was lost as sawdust to decrease. The type of set--regular set or every-tooth set--had no effect on the amount of fish that was lost.

From these observations, an "ideal" bandsaw blade was designed to reduce the loss of sawdust to a minimum. The loss of sawdust incurred by this blade was 7.21 percent less than that with the regularly-used blade producing the least loss of sawdust and was 35.4 percent less than that with the regularly-used blade producing the most loss of sawdust.

In the study of the regularly-used bandsaw blades, it was found that about 0.6-percent sawdust was lost in the first step in the cutting operation, that about 2 percent was lost in the second step, and that about 6 percent was lost in the third step. These data show the great importance of using a slicing or nonsawdust-forming cutting operation in the third step.

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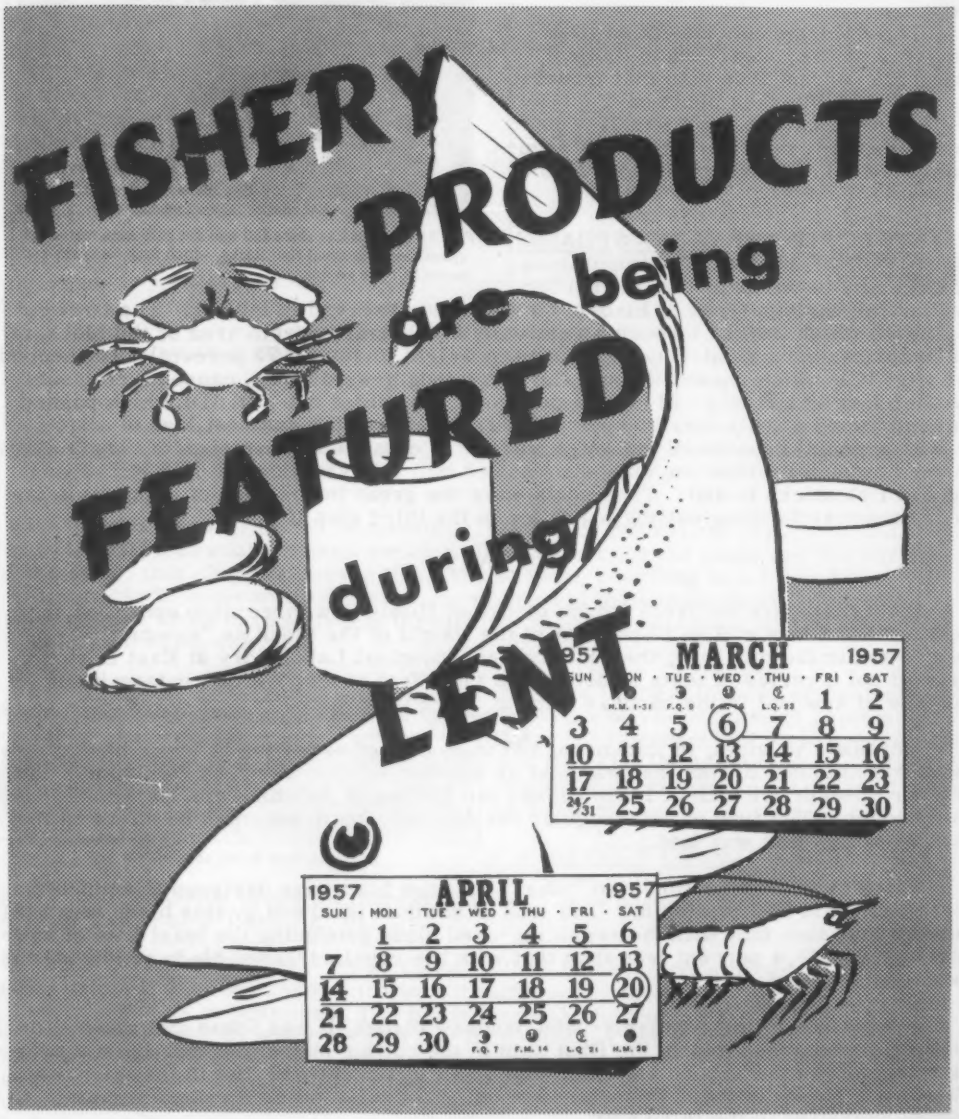

IRON SULFIDE DISCOLORATION OF TUNA CANS[1/]

No. 5 - Effect of Salt, Oil, and Miscellaneous Additives

By George M. Pigott* and M. E. Stansby**

ABSTRACT

Effect of additives as potential causetive agents in the iron sulfide discoloration of tuna cans was investigated. Copper salts caused can corrosion but no iron discoloration. A series of chemical compounds at levels normally found in canned tuna did not cause discoloration. Source of salt or of vegetable oil added had no effect on discoloration.

BACKGROUND

The formation of black iron sulfide deposits in certain batches of canned tuna has caused members of the tuna-packing industry much concern in recent years. This paper, the fifth in a series of six papers reporting the findings of an investigation into the factors associated with iron sulfide formation (Pigott and Stansby 1955), reports the effects of various additives on sulfide discoloration in tuna cans.

EFFECT OF SALT AND OIL

About $\frac{1}{8}$ ounce of salt and 1 to $1\frac{1}{2}$ ounces of vegetable oil are added to each can of tuna ($\frac{1}{2}$can) before it is seamed and retorted. A series of experiments were carried out to investigate the effect of salt and oil on can discoloration and to determine whether different batches of salt or oil affect the formation of discoloration in different ways.

Table 1 - Acid Number and Free Fatty Acid Values Obtained with Various Vegetable Oils Used in Commercial Canning of Tuna

Type of Oil	Source of Oil	Acid Number		Free Fatty Acid	
		Received 1/	Processed 2/	Received 1/	Processed 2/
	Packer	(Number)		(Percent 3/)	
Olive	A	0.51	0.51	0.25	0.25
Soya 4/	A	0.06	0.07	0.03	0.03
Soya (recovered) 4/	A	0.06	0.06	0.03	0.03
Oil (stored) 4/	B	0.09	0.09	0.04	0.04
Oil (as received) 4/	B	0.03	0.04	0.01	0.02
Oil (recovered) 4/	B	0.03	0.03	0.01	0.01
Olive 4/	C	1.56	1.59	0.79	0.80
Soya (stored in tanks) 4/	C	0.08	0.08	0.04	0.04
Soya (stored in drums) 4/	C	0.07	0.07	0.04	0.04
Soya	D	0.06	0.06	0.03	0.03

1/ Oil as received from cannery.
2/ Same as in 1/ but oil processed for 75 minutes at 240° F.
3/ Calculated as oleic acid.
4/ By the packers supplying samples.

Rock salt and table salt from several commercial sources were used (1) in experimental solid packs of yellowfin tuna that normally formed discoloration in single-enamel cans 2/ and (2) in similar packs of albacore that did not normally form the discoloration. The amount of salt or the source of salt had no effect upon the extent of can discoloration in these studies. However, if no salt was added to the yellowfin packed with added vegetable oil, no discoloration was found whatever.

Vegetable oils for experimental packs were next obtained from several tuna packers. When used in these experiments, the oils had no effect on can discoloration

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1/ This investigation, which was carried out at the Seattle Technological Laboratory, U. S. Fish and Wildlife Service, was jointly sponsored by the Continental Can Company and the U. S. Fish and Wildlife Service

2/ Unless otherwise stated, all tuna canned throughout this investigation were canned in single-enamal cans like those that were used by industry when initial outbreaks of sulfide discoloration occurred.

in the packs of the yellowfin and albacore from the same lots used in the salt source studies. These oils were also analyzed for free fatty acid content, both before and after heat processing. No increase in free fatty acid content was found after the oils were processed 75 minutes at 240° F. These results are shown in table 1.

Oil from discolored and from normal packs of tuna were analyzed for free fatty acids (table 2). The results showed no important differences in free fatty acid content of normal, spoiled, and sulfide-discolored packs.

The yellowfin that normally caused can discoloration was packed using various combinations of soya oil, saturated brine (room temperature), and salt. If both salt and free oil, or salt and free water, or free water alone were present in the canned product, can discoloration took place (table 3). On the other hand, if a free liquid was not present, no iron sulfide was formed. Thus, free liquid seems to be necessary before can discoloration will occur. The effect of free liquid will be further discussed in the next paper of this series, where work on the effect of free liquid in flaked tuna pack is reported.

Table 2 - Free Fatty Acid Content of Oil from Canned Tuna

Source of Oil	Free Fatty Acid Content
	Percent 1/
Packs from normal tuna	0.101 to 0.272
Packs from badly-spoiled fish	0.343 to 0.372
Discolored commercial packs	0.129 to 0.486

1/ Calculated as oleic acid.

EFFECT OF ADDING MISCELLANEOUS SUBSTANCES

Several substances that are known to be present in canned tuna, or that might possibly affect the formation of metal sulfide when introduced into the product, were added to experimental packs of yellowfin and albacore tuna. In each case, cans containing no additives were packed as controls. Fish that had a history of causing can discoloration as well as those that had never caused discoloration were used in the control packs. Fatty acids were added to experimental packs of albacore and yellowfin to determine the effect of free fatty acid on can discoloration. Acetic acid, butyric acid, oleic acid, and stearic acid were added in various amounts from 0 to 1 percent by weight of can contents. These acids were also added to cans containing only vegetable oil and sodium sulfide. When large quantities of the acids were present, very extensive discoloration was produced, both in the cans containing fish and in those containing only sodium sulfide and oil. However, the amounts that had to be added to obtain consistent discoloration in cans of tuna that normally did not cause the iron sulfide deposit were far above those found in the commercially-discolored tuna packs.

Table 3 - Effect of Oil and Salt on Can Discoloration in Solid Pack Tuna 1/ 2/

Additives			Discoloration
Soya Oil	Saturated Brine	Salt	
(Ounces)			(Degree)
$1\frac{1}{2}$	0	$\frac{1}{8}$	Medium
$1\frac{1}{2}$	0	0	None
0	$1\frac{1}{2}$	0	Heavy
0	0	0	Medium 3/ 3/
0	0	$\frac{1}{8}$	Medium
0	0	0	None 4/
0	0	$\frac{1}{8}$	None 4/

1/ All packs were processed for 75 minutes at 242° F.
2/ Cumulative results of 3 experiments of 96 cans each. Total of 288 cans approximately evenly divided into the 7 groups.
3/ Considerable free water was present after retorting.
4/ No free water was present after retorting.

Trimethylamine and trimethylamine oxide have been shown to affect the amount of tin going into solution in cans of herring (Jakobsen and Mathieson 1946). These substances were added to packs of albacore and yellowfin in quantities up to 1 percent by weight. The addition of trimethylamine increased tin sulfide staining but neither substance showed any effect on can discoloration from iron sulfide formation.

Glycerine, tartaric acid, sucrose, and glucose in quantities up to 1 percent by weight were added to yellowfin and albacore to see if polyhydroxy groups affected iron sulfide can discoloration. No consistent correlation of can discoloration to the presence of these substances was noted.

Monosodium glutamate, which is added by some tuna packers to enhance the flavor of the fish, was found to have no effect on can discoloration when added in amounts up to 1 percent of the total can contents.

Copper and tin ions have been considered important catalysts in the corrosion of can metal. Cuprous chloride, cupric chloride, and stannous chloride were added to albacore tuna packs in various amounts from 1 part per million to 1 part per hundred, by weight. It was found that these metals, when present in this experimentally canned albacore tuna, did not affect the ordinary type of can discoloration. However, cuprous or cupric ions, when added at a level of 100 parts per million or greater, caused corrosion within the cans resulting in hydrogen evolution and pinhole leaks.

CONCLUSIONS

1. The presence of added salt was necessary before the yellowfin tuna solid packs (with added vegetable oil) used in this investigation would cause iron sulfide discoloration of the cans.

2. The source of the salt and vegetable oil samples when added to experimental packs had no effect upon the iron sulfide can discoloration.

3. Free fatty acids (at levels normally found in canned tuna), trimethylamine, trimethylamine oxide, glycerine, tartaric acid, sucrose, glucose, and monosodium glutamate, when added to the experimental packs did not foster or hinder can discoloration to any extent.

4. Cuprous and cupric salts, when added to the experimental packs, caused can corrosion, but not iron sulfide discoloration.

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COLD-STORAGE LIFE OF FROZEN FISH IMPROVED BY BETTER HANDLING PRACTICES

The advantage of using the best possible handling procedures to gain the maximum cold-storage life of frozen fish was forcefully demonstrated by a recent experiment completed in December 1956 and carried out at the Service's Fishery Technological Laboratory. Some pink salmon, which with normal commercial handling procedures have a frozen storage life of six months or less, were kept in good condition for 14 months. The methods employed were not laboratory procedures but rather practical methods which could be adopted commercially and which consisted merely of using low-storage temperature and extra-careful glazing and packaging.

A batch of pink salmon (a species with a short storage life because of great susceptibility to oxidation) was procured in October 1955. These fish were frozen and stored for future laboratory tests. Because it was realized that oxidation would be a problem, special precautions were taken. An extra heavy ice glaze was applied and the individual, whole, glazed fish were stored in polyethylene bags to prevent the loss of the ice glaze. The fish were then stored at -20° F. In December 1956 after 14 months in cold storage, several of the fish which remained were removed, examined, cooked, and eaten. Although some slight discoloration had developed, the fish were still in good marketable condition.

This demonstrates the importance of using low (at least -20° F.) storage temperatures for frozen fish and of protecting whole fish against oxidation by use of a thick ice glaze with precautions against loss of glaze, or for renewal of the glaze at appropriate intervals.

IDENTIFICATION OF TUNA PIGMENTS

Development of off-colors of various shades (such as green or brown) in canned tuna during processing has long been a matter of concern to tuna processors. Nothing has been known as to the chemical nature of either the naturally-occurring pigments, or those which form during canning and which result in the normal desirable pink color or undesirable green or brown colors. U. S. Fish and Wildlife Service chemists and staff members of the Food Technology Department of the University of California, working in a collaborative program at Davis, Calif., have now identified the chemical nature of the normal pink pigment which forms during the canning operation, and have found means for insuring that it will develop when tuna is canned. Work is continuing toward identification of the abnormal undesirable colored pigments which sometimes develop.

When tuna is canned, the neutral grayish shade of the raw tuna meat normally is converted to a light pink color which is considered desirable by the consumer.

It is the pigment responsible for this color which has been identified as a hemochrome, a compound related to blood pigments. When exposed to air, the pink color fades rapidly to an undesirable tan color. With knowledge as to the chemistry of these changes, it may be possible to stabilize this desirable pink pigment when the contents of the can are exposed to air.

REVISED FEDERAL SPECIFICATIONS FOR BREADED SHRIMP PROPOSED

Copies of the proposed Federal Specification for "Shrimp, Frozen, Raw; Breaded," PP-S-315 dated January 21, 1957, were distributed to members of the industry for review and comment. This specification supersedes Interim Federal Specification PP-S-00315 dated July 12, 1956. This draft was prepared by the Quartermaster Corps Food and Container Institute for the Armed Forces, Chicago, Ill., and Fishery Technological Laboratory, U. S. Fish and Wildlife Service, East Boston, Mass. It is based on information which the Institute and the Service have obtained through technological research and through consultation with the industry.

As a result of industry and Armed Forces comments on the Interim Specification, certain revisions were made in the proposed draft of the Federal specification. For this reason further industry coordination is being carried out.

Pertinent revisions concern redesignation of coating content range; classification by types of inspection procedures; addition of classes; redefinition and clarification of defects; and readjustment in tolerances for defects such as black spots, fragments, damaged and broken shrimp, and loose crumbs.

Single copies of the proposed draft were mailed to approximately 200 packers, brokers, and distributors of breaded shrimp, to members of related industries, and to trade and research organizations for comment.

USE OF X-RAY FLUOROSCOPY FOR FISH BONE DETECTION SHOW PROMISE

Fish bones, long a problem to the fishing industry, may be detected in processed fishery products on the production line by means of fluoroscopy or X-rays. Preliminary research at the Service's Boston Fishing Technological Laboratory, using the latest methods and equipment in X-ray analysis, has shown very promising results for the detection of bones, cartilage, and foreign objects such as metal, stones, etc., that, as in all foods, are occasionally found in fishery products.

Approximately 50 packages of commercially-packed frozen precooked fish sticks were examined under a fluoroscope screen. Eighteen of these packages proved to be positive, i.e., bones or foreign objects were seen on the screen. These 18 packages were later examined by crushing the sticks by hand and feeling for the bones. Fifteen of these packages were found by this method of examination to contain bone or cartilage, two had pieces of metal present, and the remaining package contained what appeared to be a small stone. All of the other 32 packages that were negative by fluoroscopic examination, i.e., showed no evidence of bones or foreign matter, were also found to be free of such material when examined by hand. These preliminary results thus show considerable promise for successful fluoroscopic detection of bones and other extraneous material that might be present in fish sticks.

The research into this problem will be intensified by full-scale commercial tests to determine if fluoroscopy can be successfully applied by the fish processor as a tool in helping to maintain the highest quality in fish and fishery products.
Note: See Commercial Fisheries Review, November 1955, p. 1.

FREEDOM OF THE SEAS AND SOVEREIGNTY OVER THE SEAS

"Freedom of the seas and sovereignty over the seas by adjacent countries are simply incompatible doctrines," Senator Leverett Saltonstall (Republican-Massachusetts) told members of the National Fisheries Institute on April 16, 1956, at their Eleventh Annual Convention at Miami Beach, Fla.

Senator Saltonstall was speaking of the failure of the Inter-American Council of Jurists at their Mexico City meeting to study and discuss adequately conervation problems. "Responsible officials of our government," he said, "are most disturbed about the actions taken, with no study and little discussion."

"The United States, "he said, "second to Japan, is the largest fishing country of the world. We harvest close to five billion pounds of food from the sea each year. While most of this comes from off our own shores, our fishermen fish in the high seas off the coasts of many other countries, and the fishermen of a good many other countries fish in the high seas off our coasts, too."

Since we are a leader in conserving natural resources, the Senator went on to say, we have found peaceful means of protecting the harvest of the seas without detriment to the "freedom of the seas" doctrine, and we cannot afford to injure that doctrine.

Treaties are now in effect with other nations on the seal, halibut and salmon fisheries of the North Pacific; Great Lakes fisheries; Southeast Pacific tuna fisheries; Northwest Atlantic fisheries; and world whale fisheries.

"Friendship with our good neighbors to the south has long been a keystone in our foreign policy," he reminded his audience. "International cooperation, mutual study of mutual problems, calm discussion and debate of ideas, and multilateral approach to the solution of political, economic, judicial, security, social and defense questions has made the relations between the nations of the Americas a model for the rest of the world."

Senator Saltonstall also reported on the money spent under the Saltonstall-Kennedy Act, which provides the Fish and Wildlife Service $3 million a year for three years. ...

--Excerpt from address at National Fisheries Institute Eleventh Annual Convention, April 16, 1956.

California

ANCHOVIES ABUNDANT IN SOUTHERN CALIFORNIA WATERS: Despite fishing pressure that has steadily increased since 1951, there are now more anchovies in Southern California waters than you can scoop up in a season of heavy netting. This report should make pleasant news for commercial fishermen, ocean sport fishermen, and researchers, although biologists of California's Department of Fish and Game temper their enthusiasm on a note of caution.

While there is an abundance of anchovies, they do not appear to be as old, on the average, as they once were. Biologists consider this a warning sign that a downward population fluctuation may be indicated.

Agencies taking part in the California Cooperative Oceanic Fisheries Investigations program, now only four years old, have found that fishing pressure hasn't hurt the southern anchovy population at all.

From 1951 to 1955 commercial landings of anchovies in Southern California (Point Concepcion to San Diego) amounted to 80,204 short tons and the live bait catch to 31,152 tons, a total of more than 111,000 tons. But the evidence shows that nature has provided the anchovy with four consecutive years (1951-1954) in which survival of its spawn was abundant enough to more than compensate for all deaths occurring during this period.

For instance, the number of larval anchovies taken in the area from Point Concepcion to Point San Juanico, Baja California, has doubled from 1951 to 1955. This means that either the spawning population has doubled or there was a decided increase in the survival rate of eggs and newly hatched larvae over previous years.

That the spawning population actually has increased is substantiated by data from other sources. Results of the State's aerial survey show a marked increase in the number of schools sighted in 1956 over the previous two years in the 500-mile stretch between Morro Bay and Punta Baja in Baja California

The same cannot be said for the anchovy population off Monterey and San Francisco. There was a peak concentration in Central California in 1952, but since that date only limited numbers have appeared. Apparently, total mortality (including fishing mortality) was greater than the addition of young fish into the population. Fish born in early 1954 contributed to a slight comeback of the anchovy in Central California in 1955, but this did not compare to the increase in the southern part of the State.

Between 1951 and 1955 only 37,633 tons were landed at Monterey and San Francisco.

Does this mean that anchovies may have moved to Southern California in early 1953 when they "disappeared" from Central California waters? Or does it mean that heavy fishing, coupled with poor survival of eggs and larvae, lowered the population to a level where it was no longer economically feasible to continue fishing?

Can anchovy populations be expected to vary considerably in abundance from natural causes alone and will these variations occur, fishing or not? Also, will a continual state yearly catch of 35,000 tons never endanger Southern California stocks?

Some of these questions can be answered now, but others await the results of continuing and intensive research.

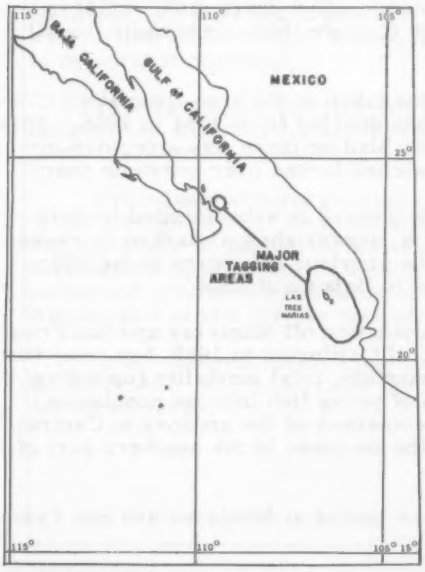
Samplings from 1952 to 1955 proved that the anchovies did not move to Southern California from the central area. In fact, up to now all information on the fish points to the fact that there is a marked separation between the stocks to the north and south of Cape San Martin, southern Monterey County, and that the two "populations" should be considered separately, especially concerning problems of fishery management.

Fortunately, laws prevent uncontrolled take of anchovies in California waters. The Fish and Game Commission has steadfastly denied permits to reduce whole anchovies into meal and oil, and in 1954 the Legislature enacted a law setting a maximum yearly take. Up to now this legislation has not had an effect upon the anchovy population, for the catch has been less than the maximum set by law.

The economic demand for anchovies has lessened considerably since the peak demand year of 1953, and the catch is not expected to reach the 35,000-ton bag limit allowed for the the period between April 1, 1956, and March 31, 1957, unless new markets for canned anchovies arise. Should the markets for anchovy products arise, the abundant stocks now available in Southern California could furnish the desired fish--at least for a year (Outdoor California, December 1956).

* * * * *

TUNA TAGGING TRIP SUCCESSFUL (M/V Sun Pacific Cruise 56-C-5): Biologists of California's Department of Fish and Game tagged 912 tuna with the help of the crew of the tuna clipper Sun Pacific during a trip (October 28-December 9, 1956) to the fishing grounds off Lower California, Los Muertos Bay, and the Las Tres Marias islands. In addition to the tagging of yellowfin and skipjack tuna, the objectives of the cruise were (1) to test the relationship of color (red, white, and blue) and the tagging position on the fish on recovery of type "G" tags, (2) to assess the occurrence of marine life by bait-net hauls, hook-and-line fishing, and night light stations, and (3) to make oceanic observations.



Sun Pacific tuna tagging cruise (Cruise 56-C-5), Oct. 28-Dec. 9, 1956.

A majority of the tuna, 99 yellowfin and 741 skipjack were tagged and released in the vicinity of the Las Tres Marias Islands, Mexico. Of the remaining tagged fish, 70 skipjack were tagged and released in the Gulf of California off Los Muertos Bay and 2 yellowtail were released off Punta Abreojos, Baja California. Table 1 lists the number of fish released by tag colors.

The surface water temperatures in the fishing areas around the Las Tres Marias Islands ranged from 25.8° C. to 27.9° C. In contrast to this range of slightly over 2° C,

the water temperatures off Los Muertos Bay were quite stable, ranging only 0.4° C., 26.8° C. to 27.1° C.

A small collection of specimens were obtained from night light stations, bait hauls and hook and line fishing.

Table 1 - Number of Fish Tagged and Released

Species	No. of Colored Tags Used			Total
	Red	White	Blue	
Skipjack	269	272	270	811
Yellowfin	35	32	32	99
Yellowtail	2			2
Total.....	306	304	302	912

Cans--Shipments for Fishery Products, January-October 1956

Total shipments of metal cans during January-October amounted to 100,876 short tons of steel (based on the amount of steel consumed in the manufacture of cans) as compared with 91,353 tons in the same period of 1955. During the month of October packers of canned shrimp, California sardines, and tuna were active. The pack of Maine sardines during October was fair.

Note: Statistics cover all commercial and captive plants known to be producing metal cans. Reported in base boxes of steel consumed in the manufacture of cans, the data for fishery products are converted to tons of steel by using the factor: 23.0 base boxes of steel equal one short ton of steel.

Federal Purchases of Fishery Products

FRESH AND FROZEN FISHERY PRODUCTS PURCHASED BY THE DEPARTMENT OF DEFENSE, NOVEMBER 1956: The U. S. Military Subsistence Market in November 1956 purchased 2,162,888 pounds (value $1,118,194) of fresh and frozen fishery products for the use of the Armed Forces. This was about one percent less in quantity but 1.9 percent more in value than the purchases in October 1956, and 11.0 percent more in quantity and 30.2 percent more in value than November 1955.

Purchases of Fresh and Frozen Fishery Products by Department of Defense (November and the First 11 Months of 1956 with Comparisons)

QUANTITY				VALUE			
November		Jan.-Nov.		November		Jan.-Nov.	
1956	1955	1956	1955	1956	1955	1956	1955
.... (1,000 Pounds)				.....($1,000).....			
2,163	1,948	24,580	23,202	1,118	859	12,321	10,031

Purchases of fishery products during the first 11 months of 1956 totaled 24,579,500 pounds valued at $12,320,723--5.9 percent more in quantity and 22.8 percent more in value than the purchases for the similar period in 1955.

Prices paid for these fishery products by the Department of Defense in November averaged 51.7 cents a pound as compared with 50.3 cents the previous month and 44.1 cents a pound in November 1955.

In addition to the purchases of fresh and frozen fishery products reported, the Armed Forces make some local purchases which are not included above. Therefore, actual purchases are higher than indicated, but it is not possible to obtain data on the local purchases by military installations throughout the country.

Fish-Hatchery Food From Anchovies Caught Near Santa Barbara, California

Enormous numbers of fish are raised in the various fish hatcheries of this country. In the rearing of these fish, large quantities of food are used. Among the matrials employed to feed the hatchery fish are frozen ground anchovies.

The principal steps in the production of fish-hatchery food from anchovies at Santa Barbara, Calif., are as follows:

1. The anchovies are caught with a modified lampara net in the waters off Santa Barbara and then are taken to port.

2. At the Santa Barbara wharf, the anchovies are pumped from the hold of the fishing vessel and are loaded into a truck.

3. The truck carries the anchovies to a production plant, where they are ground, extruded into paper bags, rapidly frozen, and then stored for subsequent shipment to the fish hatcheries. 1/

The remainder of this article gives a photographic report of these various steps.

Fig. 1 - The Captain of the trawler Linda shows a portion of the type of net used in catching anchovies. This net is a modified lampara. Note the fine mesh used for catching small fish.

Fig. 2 - Lowering the suction hose into the hold of the Linda of Santa Barbara. Note the end of the hose near the hold.

1/ The feeding of hatchery fish is a complex science beyond the scope of this article to discuss. Many factors, for example, must be considered in the use of a feed, such as the presence of thiaminase, a substance that is found in anchovies and and other fish.

Fig. 3 - Pump and pump operator. This suction pump has an unloading capacity of 3,200 pounds of anchovies per minute. The pump is operated by a 40-horsepower 220-volt electric motor actuating a vacuum pump producing 25 inches of vacuum.

Fig. 4 - Pumping anchovies into the elevator. To facilitate pumping, the captain fills the hold partially with sea water. The rubber suction hose and pump then carries the anchovies to the elevator scale house.

Fig. 5 - Scale house, operator, and tank truck. The operator weighs the anchovies as they come off the elevator. The weighing is done by means of a trip bucket. When the bucket is filled with 500 pounds of anchovies, the operator releases the bottom, and the anchovies then are carried by endless belt to the chute leading into the tank truck.

Fig. 6 - Tank truck partially filled. This truck, when filled, contains 9 tons of anchovies. These anchovies are about $6\frac{1}{2}$ inches in length.

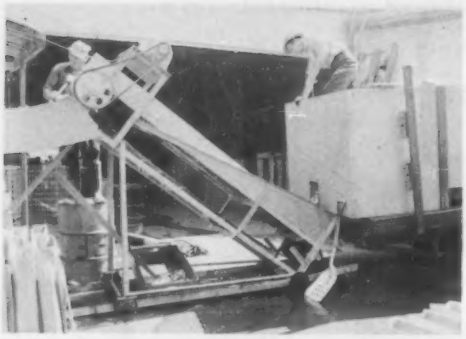


Fig. 7 - Feed conveyor. This conveyor feeds into the grinder.

Fig. 8 - Over-all view of grinding operation.

Fig. 9 - Grinder. The grinder has a capacity of 40 tons of anchovies per day. A spiral shaft operated by an electric motor forces the anchovies through any size hasher plate desired. In the photograph, a $\frac{1}{4}$-inch hasher plate is being used.

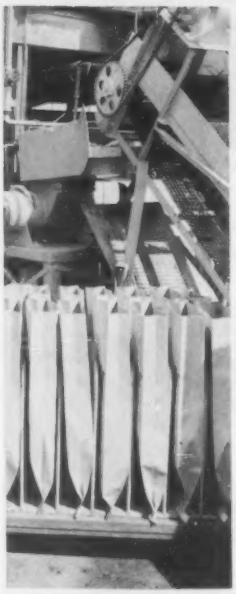


Fig. 10 - Multiwall paper bags and cart. The bags are 13x4x31 inches in size, and each one accommodates 50 pounds of groundfish. The inner wall of the bag is 60-pound, wet-wax, wet strength. The outer wall is 50-pound, natural kraft paper printed to indicate the type of fish, the size of grind, and the date the fish were placed in the freezer. The printed bag eliminates hand stenciling and thereby reduces labor costs. The carts hold 16 bags, totalling 800 pounds of ground fish when the bags are filled. Note that the bags are inserted into a partitioned plywood frame that prevents sagging of the bags and provides a uniform package. The frame is removable from the cart for cleaning purposes.

Fig. 11 - Extruder. After the anchovies pass through the hasher plate, they are extruded from this rubber inner tube. The purpose of the inner tube is to speed up the bag filling. As one bag is filled, the end of the tube is pinched and moved to the next bag in the line. When the bags on one side of the cart are filled, the cart is reversed, and the operation is continued without loss of motion.

Fig. 12 - Closure of bags. The tops of the bags are folded double and are fastened with four staples across the top. As the bags on one side of the cart are filled, those on the other side are stapled.

Fig. 13 - Cart of filled bags being taken into the sharp freezer.

Fig. 14 - Loading bags onto the coils of the sharp freezer. The temperature in this freezer is -30° F. The capacity of the coils is 360 50-pound bags or 9 tons of fish. The bags remain on the coils for 48 hours to insure thorough freezing. The anchovies shown in these photographs were caught, brought to port, unloaded, processed, and placed in this sharp freezer within 6 hours.

Fig. 15 - Storage of the bags. After the fish have been sharp frozen, they are removed to frozen storage at 0° F. Lying on top of the bags in the foreground is a part of the gravity conveyor used to remove the fish from the sharp freezer to this storage room. The metal pipe stands are of graduated height and are used to support the gravity conveyor. This storage room has a capacity of 40 tons.

Note: The author gratefully acknowledges the aid of George W. Schreck, President of Farallone Fisheries of Santa Barbara, and Captain Lloyd Lindwall of the trawler Linda.

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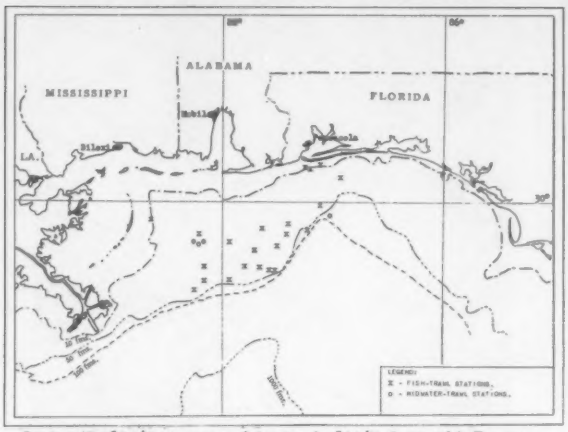
Gulf Exploratory Fishery Program

BOTTOM AND MIDWATER TRAWLS TRIED IN GULF (M/V Oregon Cruise 42 and George M. Bowers Cruise 8): Gear trials, using New England-type otter trawls and midwater trawls, were carried out in the Northeastern Gulf of Mexico from January 7-25, 1957, by the Service's Exploratory fishing vessels Oregon and George M. Bowers.



Cruise 42 of M/V Oregon and Cruise 8 of M/V George M. Bowers (Jan. 7-25, 1957).

Twenty-three drags were made over rough and broken bottom using 60' and 52' "eastern" and No. 36 New England-style trawls. Each net was fished with 70' of rollers, standard V-D gear, on 10-fathom legs. These drags were made, for the most part, in areas where bad bottom had prevented previous sampling with shrimp trawls by the Oregon. Only one net was damaged during the trials.

During the midwater trawl tests by the Oregon, telemeter readings were checked by depth recorders aboard the George M. Bowers. Accuracy of the telemeter was found to be within one fathom at all depths tested. Thirty- and fifty-foot square midwater trawls were used.

Large numbers of scrap species were caught during the bottom-trawl tests. Catches of porgies (Stenotomus), croakers, and spot varied from 1,500 to 3,000 pounds per hour drag. Several species of larger food fishes not common to shrimp trawl catches were landed, including 283 red snappers ($\frac{1}{2}$ to 30 pounds each), and large porgies (Pagrus) weighing five to eight pounds each.

During the cruise, 106 subsurface schools of fish were recorded on the Oregon depth recorders. The two largest schools were in excess of 300 yards in diameter. Attempts to sample schools with both midwater and fish trawls were generally unsuccessful. Several of the drags, however, caught small quantities of anchovy, sardine (Sardinella), chub mackerel, and rough scad (Decapturus). On several occasions large numbers of anchovy and sardine were observed "showering" through the relatively large mesh (2" to 5") as the trawls surfaced.

Hawaii

GRANTS FOR RADIOACTIVE MARINE RESEARCH: The U. S. Atomic Energy Commission has renewed a two-year contract with the University of Hawaii increasing its grant for investigation of radioactivity in marine organisms. The new contract allows the University $34,000 for continued radioactive marine research at Coconut Island. Instead of using one radio isotope at a time, as the Marine Laboratory has been doing previously, emphasis will now be on use of mixtures of radioactive materials as encountered in wastes from atomic power plants.

Future experiments outlined will attempt to find out what happens to fish and other marine organisms that live their entire lives in surroundings slightly more radioactive than they are now. (Current Affairs Bulletin, Indo-Pacific Fisheries Council.)

□□□□□□

Maine Sardines

CANNED STOCKS JANUARY 1, 1957: Distributors' stocks of Maine sardines totaled 344,000 actual cases as of January 1, 1957, an increase of 18,000 cases, or 6 6 percent, over the 326,000 cases held by distributors on January 1 a year ago, according to estimates made by the U. S. Bureau of the Census.

Canners' stocks on January 1, 1957, as reported by the Maine Sardine Industry were 879,000 cases (100 3¼-oz. cans), as compared with 475,000 cases on the same date in 1956.

Table 1 - Canned Maine Sardines--Wholesale Distributors' and Canners' Stocks, January 1, 1956 with Comparisons

		1956/57 Season		1955/56 Season				
		1/1/57	11/1/56	7/1/56	6/1/56	4/1/56	1/1/56	11/1/55
Distributor	1,000 Actual Cases	344	388	154	160	268	326	354
Canner	1,000 Standard Cases 1/	879	1,016	315	64	152	475	625

1/ 100 3¼-oz. cans equal one standard case.

The pack of Maine sardines from the beginning of the season on April 15, 1956, to the end of the packing season on December 1, 1956, totaled 2,221,793 standard cases.

Market Outlook for Fishery Products

JANUARY-MARCH 1957: Adequate supplies of most fish and shellfish are foreseen for January-March 1957, despite the seasonal lull experienced by the Nation's commercial fishing industry. This is reported in the Commercial Fisheries Outlook, January-March 1957, a quarterly publication of the United States Fish and Wildlife Service.

Oysters will be in their prime and in demand; Pacific Coast dungeness crab will be in good supply; imports, frozen stocks, and canned supplies plus some fishing, which will continue despite winter storms, will keep most supplies adequate.

Because of a number of promotional and educational campaigns conducted in 1956, the buying public should be better informed on matters pertaining to food fish in 1957; also the late Lenfen season may have a strengthening effect upon demand.

The East Coast oyster industry, still not fully recovered from the hurricane damage of recent years, will be active during the quarter but will probably not be able to meet the demand. Pacific oyster producers have reported unusually heavy demand this season from soup and stew packers and even with new oyster beds coming into production in California, the industry will be pushed to satisfy consumers.

Shrimp landings in the Gulf picked up in October, but November storms cut production considerably. Imports during the quarter will be substantial but will probably not be as high as during last winter. Cold-storage supplies are lower, but probably sufficient. Canned supplies are about the same as a year ago.

Salmon, largely because of the 25-percent increase in the Alaska catch during the 1956 season, is in better supply than a year ago, but is far from being plentiful.

Cold-storage holdings of frozen salmon are higher and mild-cured supplies are lower. Canned salmon supplies are somewhat higher than a year ago. Imports of fresh salmon from Japan and Canada were lower in recent months, but canned salmon imports were considerably higher.

Swordfish, whiting, and canned Maine sardine supplies are moderate, but canned tuna and California mackerel stocks are heavy. Halibut is in good supply because of a good seasonal catch. Haddock and ocean perch supplies are liberal, with cod, pollock, flounder, and sole stocks moderate.

Fish sticks, the first fishery product to bear the U. S. shield and grade label, are available in greater quantities and are meeting an increased demand.

The demand for clams and lobsters is good and the amounts available light; sea scallops are available and the market is firm.

Oregon

ELECTRONIC FISH COUNTER TESTED: The first extended field trials of a transistorized electronic fish counter in the United States was begun in Oregon in November 1956, according to a November 27, 1956, news release of the Fish Commission of Oregon.

The device was installed in a fishway at Bonnie falls on the north fork of Scappoose creek, a lower Columbia river tributary. The Fish Commission biologist in charge of Columbia river projects said fish tallies recorded by the electronic counter will indicate the status of steelhead and silver salmon runs utilizing the 11 miles of spawning and rearing area made available by construction of the Bonnie falls fishway in 1952.

Use of the counter at Bonnie falls will also provide the U. S. Fish and Wildlife Service with detailed information on extended field performance of the device, including maintenance costs on a "production" basis. The biologist and the engineer of the U. S. Fish and Wildlife Service who installed the counter said preliminary short-term tests of the system have been made in Alaska and Washington.

This is how the electronic fish counter works. Fish movement is channeled through two plastic "tunnels" that lie on the bottom of the uppermost pool of the fishway. Within each tunnel, two distinct electrical fields of low voltage are created electronically.

As a fish moves through one of the tunnels, it causes more electricity to flow, since fish meat is a better conductor of electricity than water. Then the increased flow of electricity trips a series of electronic relays. These relays actuate a "logic device" that records passage of the fish, either upstream or downstream, depending upon the sequence in which the tunnel relays are tripped.

Small fish can be eliminated from total counts by setting the device to record only fish above a certain size. Fish under 15 inches will be excluded from counts at Bonnie falls.

Fish are not injured by the electrical fields in the tunnels due to the low voltage. German scientists have found that fish can swim through fields of electricity of up to one volt in strength with no injury. About three-tenths of a volt is created in the fish-counter tunnels.

The transistorized electronic fish counter is a product of several research teams. N. C. Lethlean first used the conductivity method to count fish in Scotland. Electronics specialists and biologists at the U. S. Fish and Wildlife Service Fish Counting Laboratory in Seattle invented a new system which also uses this principal. A private Los Angeles firm engineered and produced the counter now being used at Bonnie falls by biologists and engineers of the Oregon Fish Commission.

About 25 electronic fish counters will be in use throughout the United States in the near future, according to the U. S. Fish and Wildlife Service biologist.

* * * * *

SOFT SHELL CLAMS PLENTIFUL IN SOME AREAS: Clam diggers have apparently been overlooking good beds of soft-shell clams in Nehalem Bay, Oregon, according to a 1956 survey by an Oregon Fish Commission shellfish biologist.

The biologist considers the condition of the Nehalem soft-shell beds excellent from the standpoint of size, abundance, and quality of clams present. In some areas of Nehalem bay, more than one clam per square foot of bed was discovered. An average of 1 soft-shell clam per 3 square feet of bed was found for 4,600 square feet of all clam flats checked in the survey.

Softshell clams were also found to be abundant on 8,000 square feet of clam beds on the Kilchis-Wilson river flats in Tillamook Bay. The quality of the Tillamook Bay bivalves from a meat yield standpoint was considered only fair, but these clams had not yet recovered from the effects of spawning.

A third survey of 9,500 square feet of soft-shell clam beds at the mouth of the Siuslaw river indicated that fewer clams are present than in earlier years. Experiments are being conducted to see if transplanted soft shell clams from other bays can be used to help improve the condition of the Siuslaw beds.

Oysters

PRELIMINARY EXPERIMENTS TO DEVELOP A NEW MECHANICAL METHOD FOR CONTROL OF OYSTER DRILLS: Some biologists and oyster growers believe that the oyster drill, Urosalpinx cinerea, is not able to emerge when buried beneath several inches of bottom substrate. However, no reliable field observations or results of experiments, conducted under controlled conditions, are available to support these conclusions. The primary purpose of the experiments described in this bulletin was, therefore, to determine the extent of mortality of drills, Urosalpinx cinerea, when buried at different depths beneath a mixture of mud-sand or mud alone. The studies were made by the Service's Biological Laboratory at Milford, Conn., and described in Bulletin No. 13, November 27, 1956.

The experiments were conducted in enamel pans, measuring 4" x 10" x 14", through which a stream of water flowed continually. Each pan was divided into two equal sections by plastic screening. This arrangement rendered it possible to observe simultaneously two groups of drills in the same pan. Mud or a mixture of mud and sand was taken from the tidal flats near the laboratory. The material was washed a number of times to eliminate the excess of decomposed organic matter and then passed through a $\frac{1}{8}$-inch-mesh screen to remove any large pieces that could aid drills in their vertical movements. During the period of observation, the temperature of the running sea water ranged between 18.0° (64.4 F.) and 21.09° C. (69.8° F.), and the salinities, between 24.0 and 25.0 parts per thousand.

In the earlier experiments, the mud-sand mixture was allowed to settle over the drills, thus burying them. This method, however, was considered unsatisfactory since it was found difficult to distribute the mixture evenly over the drills. Therefore, in all the experiments described here, the drills were pressed into the substratum by means of forceps. The depth was determined by a plastic ruler held against the forceps and was measured from the top of the drill shell to the mud-sand water interface. Various sizes of U. cinerea, ranging between 8.0-25.0 millimeters ($\frac{1}{8}$-inch), were used. The criterion of emergence was the time the drill was free to breathe, i.e., when the siphon was exposed above the bottom layer.

When the drills were buried beneath 2.0 centimeters or less of bottom material there was virtually no mortality. When buried at a depth of 3.0 cms., approximately 40 percent could not reach the surface and eventually died; at 4.0 cms., 75 percent died; and at a depth of 6.0 cms., 92 percent did not emerge. Emergence from soft mud was higher than from harder substrate. The drills experienced no difficulty in moving along the mud surface. Both large (25.0 mm.) and small (8.0 mm.) drills moved through the mud, even though submerged to half their height.

At the temperature prevailing during these experiments a heavy mortality usually began after three days, and at the end of six days practically all buried drills were dead. Further studies will determine the effect of different temperatures on the ability of drills to emerge from under a bottom material. They will also be extended to evaluate the method in connection with the control of another species of drill, Eupleura caudata.

To determine any difference in rate of emergence in relation to the size of the animal, both large (average 24.0 mm.) and medium (average 14.0 mm.) drills were buried in mud-sand substrate. The smaller drills emerged in approximately one-half the time needed by the larger individuals.

In those instances in which the drills did not emerge they were at the same depth at the termination of the experiment as originally placed. This observation indicates that there had been little or no movement. It also appeared that those U. cinerea, which started the ascent to the surface, were always successful in reaching their goal. In other words, they never stopped at any intermediate depth. Those that remained in their original position eventually perished.

On the basis of these experiments a simple method which may be practical for controlling oyster drills in many areas is suggested. The method consists of burying the drills under several inches of bottom material. This can be easily accomplished by using modified types of such devices as agricultural plows to turn over layers of bottom soil several inches deep and, thus, bury the drills. Prior to the use of such plows, however, it may be necessary, in some instances, to dredge from the bottom any accumulation of shells that is heavy enough to hinder the plowing.

We believe that bottom plowing, as a method of drill extermination, will be especially effective if repeated at approximately two-week intervals. In that case, the second plowing should bury the drills that escaped the first time.

Further studies may indicate the time of year that plowing will be most effective. Possibly, one such period is late fall or early winter when the temperature becomes low enough to render drills inactive. Under such conditions, the drills should not be able to emerge from even a thin layer of bottom deposit and, regardless of the lowered metabolic activities, should eventually suffocate and die.

If the mechanical aspects of the suggested method can be properly developed and refined, it should become of considerable help to the oyster growers in many sections of this country and abroad where the bottom is soft enough for plowing.

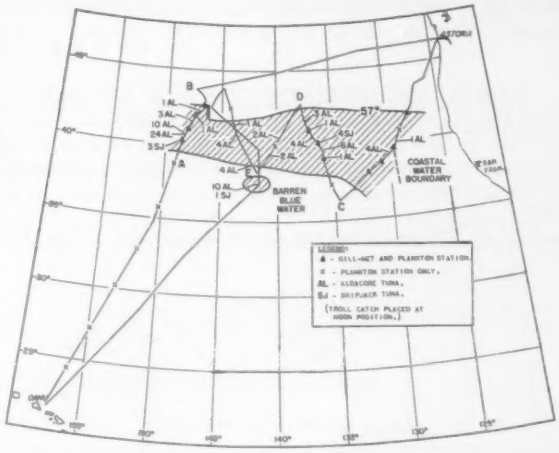
Furthermore, the construction and use of plows should be considerably cheaper than such complicated and expensive devices as suction dredges. Yet, it appears quite probable that the efficiency of plows will be considerably greater than that of small suction dredges or other devices, such as drill traps.

Since the Milford Laboratory will continue the work for developing this method, comments and suggestions from oyster biologists and members of the oyster industry would be appreciated.

Pacific Oceanic Fishery Investigations

ALBACORE DISTRIBUTION AND ABUNDANCE INVESTIGATED NORTH OF HAWAII (M/V John R. Manning Cruise 33): The fall distribution and abundance of albacore tuna in the oceanic area between Hawaii and the coastal-water boundary off the United States west coast was investigated by the Service's research vessel John R. Manning (October 17-December 11, 1956). This cruise was made in conjunction with that of the Service's research vessel Charles H. Gilbert (October 22- December 11, 1956).

Nine to twelve shackles of gill nets were set on 11 stations. Due to weather conditions these were confined to only three sections, A to B, Astoria to C, and C to D (see chart). Three albacore were caught by this means. In addition to numerous sharks and Bramidae, 7 skipjack and 1 porpoise were also caught.



John R. Manning Cruise 33 (Oct. 17-Dec. 11, 1956).

Six lines were trolled at between 6 and 7 knots on the 5 sections crossing the area mentioned above, except where weather conditions forced a reduction in the number of trolling lines to prevent tangles. By this means 79 albacore tuna were caught which broke down into 3 distinct size groups: 34 albacore 8 to 10 pounds, 38 albacore 13 to 18 pounds, and 7 albacore 22 to 25 pounds. In addition there was one troll-caught skipjack tuna.

Of the troll-caught albacore, 59 were tagged with California-type vinylite tags and released; 22 were labeled with a metal tag and frozen for canning--all of these were sexually immature. Seven gonads and 10 stomachs were preserved and morphometrics were taken on 12 albacore.

Length, sex, and spawning condition were obtained of 7 skipjack caught. Other biological and environmental observations were also made.

Although the results of gill-netting were disappointing, the troll catches when fitted into the environmental conditions provided interesting information. All catches were made in an area with well defined limits: the 57° F. isotherm on the cold side

and on the warm side the boundary of the barren and blue central northeastern Pacific water. The latter could be readily determined from the bathythermograph sections and to a lesser degree from Secchi disk readings.

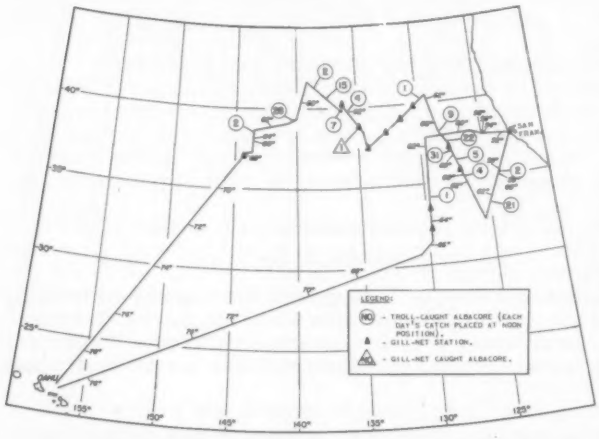
In the central water the disk could generally be seen at a depth of 16 to 18 fathoms with a blue color, Forel No. 2. Proceeding northward into the water where albacore were found, the depths were between 10 and 12 fathoms and the color blue-green, Forel No. 3 or 4. In the coastal water the depths were 7 to 9 fathoms and the color was green, Forel No. 6.

Of interest were also the surprisingly small samples obtained from the half-hour surface plankton hauls. This, together with a very stable 200-foot deep mixed surface layer and relative high transparency and blueness of the water in the albacore zone, suggests that the dormant period of organic production had set in.

Finally, it is worthy to note that this has been the first time that skipjack were caught by means of POFI gill-nets. In the first instance, 3 were taken at 40° N., and 148° W.; the temperature was 64° F. Later, at 40° N. and 136° W., 4 were taken at a temperature of 60.3° F. All weighed close to six pounds each.

* * * * *

ALBACORE DISTRIBUTION AND ABUNDANCE SURVEYED EAST OF HAWAII: (Charles H. Gilbert Cruise 31): As part of a continuing study of the seasonal fluctuations in abundance of albacore tuna and in conjunction with surveys of the inshore albacore populations being made by the states of California, Oregon, and Washington, the Service's research vessel Charles H. Gilbert surveyed (October 22-December 11, 1957) the area off the Pacific west coast between latitude 35° to 41° N. and longitude 145° to 126° W.


LEGEND:
- TROLL-CAUGHT ALBACORE (EACH DAY'S CATCH PLACED AT NOON POSITION).
- GILL-NET STATION.
- GILL-NET CAUGHT ALBACORE.
SAN FRAN.

M/V Charles H. Gilbert Cruise 31 (Oct. 22-Dec. 11, 1956).

Eleven gill-net stations were occupied during the cruise (see chart). At each station 11 or 12 shackles of nylon gill nets were fished. The nets were 50 fathoms in length and the stretched-mesh size varied from $4\frac{1}{2}$ to $7\frac{1}{2}$ inches. With a complete set of 12 shackles there were 2 shackles of $4\frac{1}{2}$" mesh, 4 of $5\frac{1}{2}$", 4 of $6\frac{1}{2}$" and 2 of $7\frac{1}{2}$". In addition to the gill nets, two shackles of trammel nets were fished on the first station. Because of extensive tangling and damage sustained on the first station the trammel nets were omitted from subsequent sets. Only one albacore (7 pounds) was taken on the nets. The albacore was caught at 38°30' N. latitude, 134°54' W. longitude and was found gilled in one of the $6\frac{1}{2}$" mesh shackles. In addition to the albacore, the gill-net catch consisted of 127 great blue sharks, 2 mako sharks, 181 pomfrets, 33 squid, and part of the head of a spearfish.

A total of 154 albacore were caught in 4,365 hours of trolling. A maximum of 8 lines were fished at any one time using a variety of feather and plastic jigs. Two

big-eyed and 11 dolphin were also taken by trolling. The best single day's catch was 31 albacore landed from 42 strikes at about 37° N. latitude, 127°30' W. longitude.

Seventy pounds of small tilapia were carried in the bait tank with the intention of chumming albacore and fishing them by pole and line. The procedure followed was to chum tilapia whenever three or more simultaneous strikes occurred on the trolling lines. Although we were unsuccessful in raising any fish, we did catch one albacore by trolling which contained several small tilapia and one piece of cut bait in its stomach. The mortality of the tilapia was very low (generally less than six a day) in spite of crossing several temperature discontinuities. The greatest change occurred just west of San Francisco with a 7.5° F. rise in surface temperature within two hours. The range in temperature the tilapia were subjected to was a maximum of 81.5° F. southwest of San Francisco.

A total of 114 albacore and 1 big-eyed were tagged and released using the California-type white plastic tags. Three of the tagged fish were double-tagged using an experimental dart tag as a second tag.

Morphometric measurements were taken on 26 albacore tuna. Forty-one stomachs and gonads were saved for detailed study. The majority of the albacore were sexually immature with ribbonlike gonads.

A 30-minute surface plankton tow was taken at 10 of the 11 gill-net stations. In addition 24 30-minute oblique plankton hauls down to 140 meters were taken.

The "Sea Scanar" was operated on the cruise with the hope of locating albacore without visible surface signs. Only in one instance were we able to attribute returns as those being made by albacore. This occurred at 37°18' N. latitude, 127° 45' W. longitude and positive identification was made when albacore were observed jumping.

Rough Fish Control Measures Intensified

States are attacking the rough fish menace chemically, electrically, and mechanically in their efforts to find ways and means of controlling those unwanted populations with a minimum of injury to game species, U. S. Fish and Wildlife Service officials report. If an effective method is developed, one of the most difficult fish-management problems of the present time will be rendered much less complicated, state and Federal fishery biologists agree.

Much of the work which the states are doing is being carried on with Federal Aid funds which come from a 10-percent tax on sport fishing rods, reels, creels, and lures. The attack on rough fish has been going on for years but if the Federal Aid projects are a criterion the tempo was increased in 1956. During that year when five states which had immediate problems were "cleaning up" 20 lakes and ponds with rotenone, 16 States were conducting 29 research projects on how to control rough fish without damage to the fish the sportsmen seek.

One of the mechanical ways of controlling rough fish in a lake is to lower the level of the water immediately after the rough fish have spawned along the shallow edges, exposing the eggs to the drying sun and wind. This system presupposes two things--that the lake is inhabited by a game species which spawns at a time different from that of the rough fish, and that it is feasible to reduce the lake level at the proper time.

During the year South Dakota, with the cooperation of the Corps of Engineers, fluctuated the level of the new Fort Randall Reservoir, preventing successful reproduction of a large portion of the trash fish without harming the game species.

Several states have turned to the field of electricity for the answer to the problem of selective killing of rough fish. Wisconsin has carried on some basic research in the relations between electrical factors and electrode design as well as the amount of electrical energy fish receive when in various electrical fields. Studies indicate that carp can be electrically "herded" or concentrated in a small area from which they can easily be removed. More work must be done on this project before any definite decisions can be made. New York, Florida, and Kentucky have also done research on electrical control of fish.

Texas, Florida, and Kentucky have continued to secure promising results with low concentrations of rotenone for selectively killing gizzard shad, drum and, to some extent, carp. (Previous experiments in other States have indicated that some fish which have been rendered helpless can be revived if the rotenone is removed with other chemicals, making it possible to save game fish which have been victims along with the unwanted species. Rotenone, officials point out, is not an internal poison but rather paralyzes a fish's gills, making breathing impossible).

Washington reclaimed 843-acre Cavanaugh Lake with rotenone; Idaho cleared up its Stanley Lake of 179 acres in the same way; Minnesota killed the rough fish in another seven lakes which have a total of 89 acres; and Maine used rotenone in six ponds totaling 270 surface acres. Oregon continued its vigorous chemical attack on trash fish--it used rotenone to rid its 1,113-acre Lake of the Woods in Klamath County and three of its tributary streams of tons of carp and yellow perch. Oregon also rehabilitated Malheur Reservoir, Beulah, Warm Springs, Thompson Valley Reservoirs, and the tributary streams. (The Fish and Wildlife Service previously rehabilitated Malheur Lake on the Malheur refuge.)

Saltonstall-Kennedy Act Fisheries Projects

COMMERCIAL FISHERIES STUDIES ALLOTTED ADDITIONAL FUNDS: Funds allotted for market, technological and biological research, and for the exploration and development of American commercial fisheries were increased by $3,595,000 by the Secretary of the Interior. With the $3,000,000 currently allotted for this work, the total now available is $6,595,000.

The Secretary's action was based upon provisions of the Fish and Wildlife Act of 1956 which increased the amount of money available to the United States Fish and Wildlife Service under the Saltonstall-Kennedy program to aid the domestic fishing industry. Funds for this activity are provided from customs receipts on fishery products. Expenditure of $6,595,000 now available for the fiscal year ending June 30, 1957, will be under the direction of the Bureau of Commercial Fisheries.

In some instances long-range projects will be contracted with state, college or private research organizations during this fiscal year but the work performed over a longer period.

Funds available through the Saltonstall-Kennedy sources are larger this fiscal year than normal because the Fish and Wildlife Act of 1956 permitted the use of some accrued receipts. In the future the amount of money available through this source will approximate $4,500,000 a year.

The new allocations increased the amounts available for fishery biological studies in the commercial fishery field from $1,376,500 to $3,394,000, an addition of $2,017,500.

Other commercial fishery studies, which include exploration and gear research, economic research, market reports, market development, and education, and technological research, have been allotted $2,814,000, an increase of $1,395,500 over the initial amount granted. Miscellaneous items including administration, total $387,000 under the new allotment, compared with $205,000 previously.

The additional funds will help the Bureau of Commercial Fisheries begin work on the backlog of fishery problems which have been calling for attention for some years but for which funds were not available.

An allotment of $630,000 will finance a three-year research program on tuna. Studies will be undertaken in the area fished by the Pacific Coast tuna men, a vast region north of the equator and extending for several hundred miles into the Pacific ocean. This work will include research of hydrographic fronts, food prevalence under varying oceanic conditions, tuna and tuna bait fish behavior under changing conditions, and numerous other items which will help technicians understand and forecast tuna abundance.

Coastal and offshore biological research was granted an additional $1,009,500, making $2,073,200 available for that purpose. Alaska salmon research will get $389,600 of this money which will give a big impetus to research in that important fishery. Total available for the Alaska salmon research is $572,600. Projects include development of methods for more accurately predicting salmon runs and measuring escapement, studies of migration patterns of red and pink salmon and causes of pink salmon mortality during the fresh-water phase of its life history. Nearly $84,000 of the new money was earmarked for Pacific herring studies in Alaska and $130,000 was allocated to study Alaska's king crab.

Because more biological data is needed on sea scallops, flounders, whiting, and ocean perch, $145,000 was added to the $294,000 designated for the North Atlantic trawl fishery. North Pacific ocean fisheries got $90,000; menhaden research got $121,000, principally for work in the Gulf of Mexico; Atlantic striped bass work got $20,000 added to $32,000; and $30,000 was added to the Gulf of Mexico expenditures for improvement of research facilities.

Oyster problems got the bulk of the extra shellfish research money, $108,000. Under the previous allocation, the New England, Gulf, and Middle Atlantic oyster fisheries each had $25,000 for research matters and $75,000 was allocated for new blue crab research. The total now set up for shellfish research is $258,000.

Inland commercial fisheries, principally the Great Lakes, which had no Saltonstall-Kennedy research funds originally, received $195,000 of the new funds.

Of the $1,395,500 added to commercial fishery studies, exploratory fishing and gear research got $453,300; technological studies, $386,700; fishery statistics, $50,500; economic studies, $104,000; market development and education, $300,000; and market news, $101,000. Total available for these various studies from fiscal 1957 funds is now $2,814,000.

The added exploratory fishing and gear research funds will permit the Service to expedite and expand its survey of resources available to domestic vessels. More adequate information on the extent and character of potential resources and the best means of harvesting them will be sought. The new money will permit more extensive exploration work in the North Atlantic for trawl fish and scallops, shrimp in the South Atlantic, bottom or midwater varieties in the North Pacific, as well as more thorough exploration of shrimp and other potentialities in the Gulf and Caribbean. The total amount available for exploration and gear research is $757,300.

Research in fishery technology has been along two major lines. One is to devise ways and means of retaining fish freshness for a longer period to give inland America an opportunity to enjoy "ocean fresh" fish and fish products. The other is to devise new uses for industrial products such as fish meal and fish oil.

To the $459,000 originally set aside for this work has been added $386,700 to make a total of $845,700. Nearly $80,000 of the new funds have been allocated to the new laboratory under construction in Mississippi for work on Gulf technological problems. This is in addition to $40,000 now available for Gulf oyster-processing and transporting problems.

About $50,000 has been added to the $127,000 designated for development of standards for prepared fishery products, and $100,000 has been allotted for developing improvements in blue crab processing techniques to meet new standards. And $80,000 has been provided for radiation preservation research on fishery products as part of the President's Atoms for Peace programs; $50,000 for extending tuna-quality studies to the processing stages; and smaller amounts for development of a chemical index for fish meal, and for new uses for fish oil and meal.

Economic studies, especially on fish consumption, have been allotted $242,000 under the revised plan, of which $104,000 represents added funds. For the promotion of the use of domestic fishery products by marketing studies and educational means $300,000 was added to the original $317,500

The bulk of the added money--$250,000--is for market development activities, including special marketing programs, and intensive studies of market patterns. Because the Nation is only partially covered with respect to school-lunch and similar programs, the balance will be devoted to filling these gaps.

The additional funds also permit an opportunity to strengthen the Fishery Market News Service in the major fish marketing and producing areas of the Nation. For this work $101,000 of the additional funds was allocated.

Standards

FRESH FISH QUALITY IMPROVEMENT RULES AND STANDARD PROCEDURES: The program to put into effect the Rules and Standard Procedures for quality improvement of fresh fish began on January 1, 1957. These rules are for both fishermen and primary wholesalers, wholly on a voluntary basis. They were developed by the

To Be Posted in All Places of Business

RULES AND STANDARD PROCEDURES FOR QUALITY IMPROVEMENT

For Use on a Voluntary Basis by NEW ENGLAND PRIMARY WHOLESALERS

(Prepared by members of the Industry, the Technology Division of the National Fisheries Institute and the Bureau of Commercial Fisheries)

Removal of Fish from Boats

1. Conveyances (Carts, Boxes, Trucks, etc.) must be in a clean and sanitary condition before receiving fish.
2. Conveyances must never be overloaded.
3. Covers must be provided for use on all conveyances and covers must be used immediately the conveyance is loaded regardless of location.
4. Fish stored in conveyances, or stored in areas awaiting handling, must be iced at all times.
5. Fish that have been iced awaiting handling must be inspected periodically for ice renewal when needed.

Plant Procedure

1. Forks and hooks used in direct handling of fish must be abolished wherever possible.
2. Containers used for shipment of fresh fish must be clean and new.
3. The practice of returning packages (Barrels, Boxes, etc.) for credit or REUSE must be abolished entirely except for tight containers where fish are floated.
4. Fish (Fillets, etc.) awaiting handling (to and at freezer) must be racked to relieve pressure, if possible, on racks requiring no additional handling.
5. Fillets, etc., in a fresh condition, to be transferred from one place to another for any reason whatsoever, must be carried in containers provided for the purpose, each container to be covered and iced regardless of destination.

Sanitation

1. Carts, boxes and conveyances of any kind must be washed thoroughly, immediately after they become empty of fish.
2. Plant and equipment must be subject to constant washing down when plant (or store) is in operation.
3. Responsibility for plant cleanliness must be specifically assigned to a person (or persons).
4. Exterminators (individuals or firms) must be employed for the control of rodents, vermin, flies, etc.
5. Fish operations (filleting, cutting, etc.) practiced in the open must be abolished. Proper cover and facilities must be available.
6. Clothing of all personnel must be kept in a clean condition consistent with the requirements demanded in the handling of food.
7. Smoking in filleting rooms and wrapping rooms — on lines, tables or benches used for processing — must be abolished.

This poster is white and gives fresh fish quality improvement rules and standard procedures for use by New England Primary Wholesalers.

To Be Posted at Sea and Ashore.

RULES AND STANDARD PROCEDURES FOR QUALITY IMPROVEMENT

For Use on a Voluntary Basis by NEW ENGLAND TRAWLERS

(Prepared by members of the Industry, the Technology Division of the National Fisheries Institute and the Bureau of Commercial Fisheries)

Handling of Catch

1. Fish must be gutted thoroughly, leaving no part of the gut (livers, etc.) to start spoilage.
2. All sizable fish (over 2 lbs.) must be gilled winter and summer.
3. Gutted fish must be washed thoroughly.
4. Water in washing box must be changed frequently — do not depend on the overflow.
5. Fish must be put down and out of the weather as quickly as possible.
6. Fish coming out of the hold must be sorted with care to cut down on number of culls.

Icing

1. Ice bed in pen must be at least six inches (6") thick.
2. Jagged edges in crushed ice must be pounded out (bottom fish carry the weight).
3. At least three inches (3") of space must be left between fish, pen boards and hull so that when you build up the ice will enter this area for proper keeping.
4. All layers of fish in pens must be gauged to the size of the variety so that ALL fish get the benefit of ice.
5. Never neglect to shelve fish. Protect your investment in labor of catching and handling by relieving pressure.
6. Plenty of ice must be used at all times. Ice is cheaper than fish. Protect against breakdown, bad weather and accident or sickness.

Sanitation

1. The hold must be dried out and painted thoroughly at least once a year.
2. The hold must be washed completely after the discharge of each trip. After thorough washing, sprinkle entire area with salt or any other similar agent.
3. Pen boards must be washed and scrubbed immediately after they come out of the hold. Keep pen boards painted. Replace worn or beat-up boards immediately.
4. Working tools, which come in contact with fish, must be kept clean and free of rust.
5. Culls must be handled quickly when discharging trip. Do not throw them back on deck. Place them immediately in iced container on the dock.
6. Facilities provided for personal cleanliness must be used.

REMEMBER ALWAYS THAT YOU ARE HANDLING FOOD

This poster is colored yellow and gives fresh fish quality improvement rules and standard procedures for use by New England Trawlers.

Technology Division of the National Fisheries Institute under the terms of its contract with the Bureau of Commercial Fisheries of the United States Fish and Wildlife Service, through discussions with the various state and Federal agencies, universities, unions, associations, and other groups which are interested in the problem of product quality improvement in the fishery industries. The contract was financed by funds provided by the Saltonstall-Kennedy Act of 1954.

This is the initial application of the Rules on the Atlantic Coast. As developed and adopted, the rules consist in reality of two sets: one set designed for use on the New England trawlers; the second for use by New England primary wholesalers. As an important part of its contract, the N. F. I. Technology Division will prepare for distribution as supplementary information simplified versions of the extensive technical literature which has been developed by the U. S. Fish and Wildlife Service and other agencies in the fisheries research field. The expansion of the program will proceed as rapidly as is consistent with a thorough job at each stage. Appropriate rules will be developed for each of the other levels in the distribution chain. The basic Rules will then be adapted to conform to the many varieties of fish found on our national market. Each set of Rules will be prepared on a different colored background so that it may be easily identified as pertaining to a specific variety of fish, geographical area, or stage in the distribution chain.

United States Fishing Fleet[1/] Additions

DECEMBER 1956: A total of 36 fishing craft of 5 net tons and over were issued first documents as fishing craft during December 1956. This was 20 vessels more than the reported number for the corresponding month of 1955, reports the Bureau of Customs.

Table 1 - U. S. Vessels Issued First Documents as Fishing Craft, December 1956 with Comparisons

Area	December		Annual Totals			
	1956	1955	1956	1955	1954	1953
			(Number)			
New England	1	-	15	18	23	20
Middle Atlantic	3	-	26	13	15	19
Chesapeake	18	3	138	54	93	83
South Atlantic	8	1	119	65	119	116
Gulf	4	6	100	103	313	264
Pacific	2	5	76	117	117	164
Great Lakes	-	-	6	9	6	7
Alaska	-	-	40	35	27	53
Hawaii	-	-	1	3	1	3
Puerto Rico	-	-	-	-	2	-
Virgin Islands	-	1	-	1	-	-
Unknown	-	-	-	-	1	-
Total	36	16	521	418	717	729

Note: Vessels assigned to the various areas on the basis of registered home ports.

During December 1956 the Chesapeake area led all other localities with 18 newly-documented fishing vessels, followed by the South Atlantic States with 8, the Gulf area with 4, the Middle Atlantic States with 3, the Pacific States with 2, and the New England States with 1.

YEAR 1956: A total of 521 vessels was documented for the first time as fishing craft during 1956 compared with 418 during 1955--a gain of 25 percent. The increase in newly-documented fishing craft during 1956 occurred in the Middle Atlantic, Chesapeake, and South Atlantic areas. Decreases were noted in all other areas.

Table 2 - U. S. Vessels Issued First Documents as Fishing Craft, 1938-56

Year	Number	Year	Number
1946	1,085	1956	521
1945	741	1955	418
1944	635	1954	717
1943	358	1953	729
1942	358	1952	675
1941	354	1951	780
1940	320	1950	812
1939	357	1949	1,002
1938*	376	1948	1,184
		1947	1,300

*Data partly estimated.

Historical data covering the years 1938 to 1956 inclusive, reveal that during the 19-year period 12,722 vessels were issued first documents as fishing craft.

1/ Includes both commercial and sport fishing craft.

U. S. Foreign Trade

IMPORTS OF CANNED TUNA IN BRINE UNDER QUOTA PROVISO: The quantity of tuna canned in brine which may be imported into the United States during April 16 through December 31, 1956, at the 12½-percent rate of duty is limited to 28,757,393 pounds. Any imports in excess of that quantity will be dutiable at 25 percent ad valorem.

Imports under the quota from April 16-December 31, 1956, amounted to 27,741,867 pounds, according to data compiled by the Bureau of Customs. This left a balance of 1,015,526 pounds of the quota which was not utilized during the calendar year of 1956. Since the quota for the period indicated in 1956 was not exceeded, no imports of tuna canned in brine were entered at the duty of 25 percent ad valorem.

* * * * *

EDIBLE FISHERY PRODUCTS, OCTOBER 1956: United States imports of edible fresh, frozen, and processed fish and shellfish in October increased 62 percent in quantity and 48 percent in value as compared with September 1956. Compared with October 1955 the imports for October 1956 were higher by 23 percent in quantity and 41 percent in value. October 1956 imports averaged 28.4 cents a pound as compared with 24.7 cents a pound for the same month in 1955. Both groundfish fillets (including ocean perch) and canned salmon during the month were up sharply from October 1955.

Table 1 - United States Imports of Edible Fishery Products, October 1956 With Comparisons

Item	Oct. 1956	Oct. 1955	Year 1955	Oct. 1956	Oct. 1955	Year 1955
	(Millions of Lbs.)			..(Million of $)..		
Imports:						
Fish and shellfish:						
Fresh, frozen & processed 1/	91.2	74.3	769.9	25.9	18.1	206.4
Exports:						
Fish and shellfish:						
Processed 1/ only (excluding fresh & frozen)	11.8	5.7	91.0	2.9	1.6	21.6

1/ Includes pastes, sauces, clam chowder and juice, and other specialties.

Exports of processed fish and shellfish in October 1956 increased about 168 percent as compared with the previous month and 107 percent above October 1955. The October 1956 value of these exports was 71 percent higher than the previous month and 81 percent above the same month in 1955. The sharp increase over September 1956 and October 1955 was due primarily to heavier exports of California sardines.

* * * * *

GROUNDFISH FILLET IMPORTS: Year 1956: Imports of cod, haddock, hake, cusk, and ocean perch fillets (including blocks) into the United States totaled an estimated 138.6 million pounds in 1956. This was an increase of approximately 1.1 million pounds above the previous record of 137.5 million pounds in 1954. Compared with 1955, it represented an increase of about 8.5 million pounds.

Eleven countries exported groundfish fillets to the United States during 1956. Canada (99.8 million pounds) led all other countries and accounted for 72 percent of the total. Iceland (27.1 million pounds) was in second place with 20 percent of the import total, followed by Norway (4.1 million pounds), Denmark (3.0 million pounds), West Germany (2.0 million pounds), and France (919 thousand pounds). Imports from the United Kingdom, the Netherlands, Greenland, Miquelon and St. Pierre, and the Union of South Africa accounted for only 1 percent of the total.

December 1956: During December 1956, a total of 4.3 million pounds of groundfish fillets (including blocks was received in this country. This was an increase of 4 percent (160 thousand pounds) as compared with the corresponding month of 1955.

Groundfish and ocean perch fillets received from Canada during December 1956 totaled 3.7 million pounds and amounted to 84 percent of the month's total receipts.

Iceland accounted for 10 percent, and the remaining 6 percent was received from Norway, Denmark, and West Germany.
Note: See Chart 7 in this issue.

Wholesale Prices, December 1956

December 1956 was a month of light production for many of the United States fisheries due to low seasonal abundance for some important varieties, curtailed fishing effort before and after the Christmas holidays, and bad weather. Some unusually bad fishing weather was reported in the middle and north Atlantic areas. The December 1956 wholesale prices index (116.1 of the 1947-49 average) for all edible fish and shellfish (fresh, frozen, and canned) declined about 2 percent from the previous month, but was 3.1 percent higher than the December 1955 index.

Table 1 - Wholesale Average Prices and Indexes for Edible Fish and Shellfish, December 1956

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices1/ ($)		Indexes (1947-49=100)			
			Dec. 1956	Nov. 1956	Dec. 1956	Nov. 1956	Oct. 1956	Dec. 1955
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					116.1	118.4	112.5	112.6
Fresh & Frozen Fishery Products:					126.6	130.9	122.0	121.1
Drawn, Dressed, or Whole Finfish:					118.6	128.0	122.5	117.0
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.09	.12	92.7	122.1	67.4	124.3
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.35	.37	108.3	112.9	133.5	85.1
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.64	.65	143.8	144.9	150.6	133.1
Whitefish,L. Superior, drawn, fresh	Chicago	lb.	.61	.59	151.2	146.3	135.9	131.4
Whitefish,L. Erie pound or gill net, rnd., fresh	New York	lb.	.71	.74	143.6	149.6	161.8	136.5
Lake trout, domestic, No. 1, drawn, fresh	Chicago	lb.	.71	.70	145.4	143.4	153.6	132.2
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.36	.34	84.4	80.3	83.3	102.0
Processed, Fresh (Fish & Shellfish):					134.7	135.5	125.4	124.1
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.30	.35	103.8	117.4	91.9	132.7
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	.82	.82	129.6	128.8	112.2	113.4
Oysters, shucked, standards	Norfolk	gal.	6.00	6.00	148.5	148.5	148.5	136.1
Processed, Frozen (Fish & Shellfish):					118.2	118.6	106.2	114.2
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.40	.40	103.4	103.4	102.1	104.7
Haddock, sml.,skins on, 1-lb. pkg.	Boston	lb.	.28	.28	87.9	87.9	86.3	91.0
Ocean perch, skins on, 1-lb. pkg.	Boston	lb.	.28	.27	110.8	108.8	108.8	112.8
Shrimp, lge. (26-30 count), 5-lb. pkg.	Chicago	lb.	.82	.83	126.0	127.3	105.7	116.5
Canned Fishery Products:					101.2	100.6	99.0	100.5
Salmon, pink, No.1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	22.65	22.65	120.0	120.0	120.0	114.8
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	11.20	11.20	80.8	80.8	78.2	85.1
Sardines, Calif., tom. pack,No. 1 oval (15 oz.), 48 cans/cs.	Los Angeles	cs.	9.00	8.35	105.0	97.4	90.4	81.7
Sardines, Maine, keyless oil, No. 1/4 drawn (3-1/4 oz.), 100 cans/cs.	New York	cs.	7.70	7.70	81.9	81.9	81.9	92.6

1/Represent average prices for one day (Monday or Tuesday) during the week in which the 15th of the month occurs. These prices are published as indicators of movement and not necessarily absolute level. Daily Market News Service "Fishery Products Reports" should be referred to for actual prices.

The drawn, dressed, and whole finfish subgroup index for December decreased 9.3 percent as compared with November and exceeded that for the same month in 1955 by only 1.4 percent. Although there was a drop of 24-25 percent in fresh drawn haddock ex-vessel prices at Boston, this has little significance due to the

wide fluctuations from day to day for fresh haddock, as well as for other fresh fish, during periods of temporary fluctuations in landings. Prices for the other six items in this subgroup in December varied only slightly from November and were higher than a year earlier in all cases except for lower yellow pike prices.

No significant changes in the fresh processed fish and shellfish subgroup occurred from November to December. A drop of 11.6 percent in fresh haddock fillet prices at Boston in December was offset largely by fractionally higher prices for fresh shrimp. When compared with December 1955, this subgroup index for December 1956 was higher by 8.5 percent with lower (down 21.8 percent) fresh haddock fillet prices more than offset by increases in fresh shrimp prices. Prices for fresh shucked oysters, which are in short supply, remained unchanged from November to December 1956 and were 9.1 percent higher than for December 1955.

The December 1956 subgroup index for frozen processed fish and shellfish was almost unchanged (down less than 1 percent) from November and up 3.5 percent from December 1955. Frozen fillet prices were unchanged for haddock and flounder and up slightly for ocean perch. Frozen shrimp prices at Chicago were lower by one percent in December 1956, but higher by 8.2 percent when compared with the same month in 1955.

Prices for canned fishery products in December 1956 continued the tendency to creep upwards first noted in September. Prices were unchanged for all items in this subgroup except California sardines, which advanced 7.8 percent from November and were 28.5 percent higher than in December 1955. After a promising start, the California sardine season, as it advanced, fell far short of estimates and prices were withdrawn by the packers in order to conserve stocks for commitments. Maine sardine prices this December were down about 11.5 percent from the same month in 1955 because this season's pack was almost double the abnormally low pack in 1955.

CORRECTION

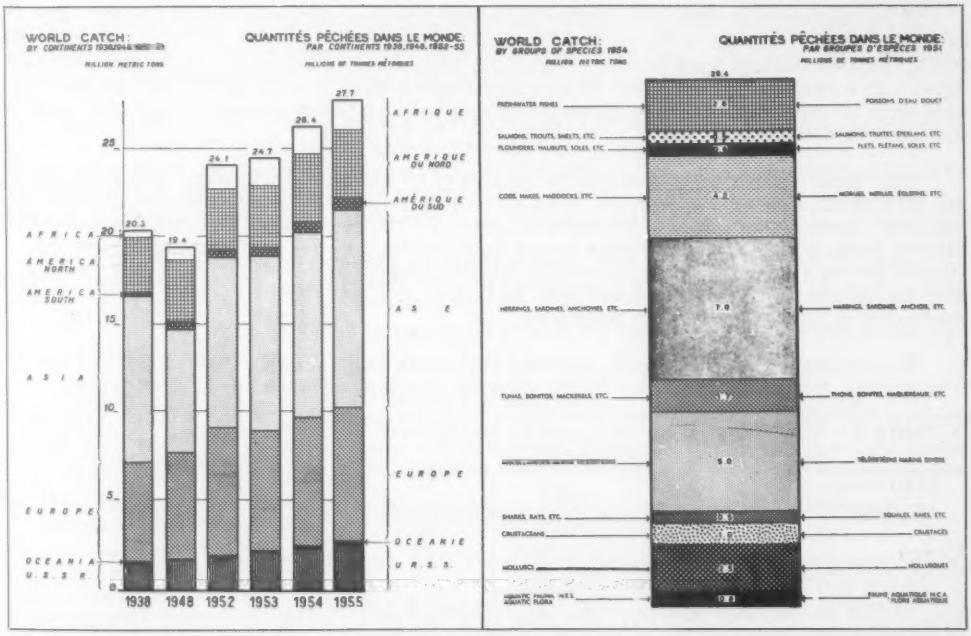
The news item "U. S. Fish Catch May Set All-Time Record in 1956!" on page 51 of the December 1956 issue of Commercial Fisheries Review contained an error in the first sentence, which should have read: "United States and Alaska fishermen may catch more than 5 billion pounds of fish in 1956 and . . . ."

FOREIGN

International

FOOD AND AGRICULTURE ORGANIZATION

UNITED STATES SECOND IN LIST OF FISHING NATIONS: The United States, with a fisheries catch of some 2,687,000 metric tons a year, is second to Japan as a fish catching nation, according to the Food and Agriculture Yearbook of Fishery



Statistics (Vol. V, Production and Fishing Craft), recently published. (Since the statistics in the yearbook are based on live (whole or fresh round) weight for both fish and shellfish, the data for the United States are higher in the Yearbook than in United States Fish and Wildlife statistics because the latter reports mollusks on the basis of the weight of edible meats instead of weight in the shell).

Although there was a slight reduction in the 1955 United States catch as compared with the 2,706,400 tons for 1954, the general trend is towards increased production, as the following figures (in metric tons) show: 2,253,100 (1938); 2,409,900 (1948); 2,390,600 (1952); and 2,437,500 (1953).

This increase in the catch over that of prewar years is in accordance with the general picture for North America and for the world in general. Table 1 illustrates the trend in fisheries production in North America during the past 17 years.

Table 1 - North American Fisheries Catch, 1938, 1948, and 1955

Area	1955	1948	1938
	(Metric Tons)		
Northern area 1/	3,660,000	3,490,000	3,100,000
Central mainland area	20,000	70,000	90,000
Central Caribbean Islands area	30,000	30,000	50,000

1/Includes the Bermuda Islands, Greenland, St. Pierre and Miquelon, Canada, and the United States (with Alaska).

Of the total catch of North America (3,800,000 tons), herring, sardines, anchovies, etc., account for the largest share, 1,260,000 tons (1955). Next come cod, hake, haddock, etc., with 630,000 tons; and third (of the fish), salmon, trout, smelt, etc., with 230,000 tons. Mollusks account for 660,000 tons and crustaceans for 220,000.

This increase in fish production is, again, in line with the world trend. According to the Yearbook, the world fisheries catch has risen from 19,390,000 (1948) to 27,720,000 metric tons (1955), excluding aquatic mammals, or more than 40 percent. The catch is now almost 40 percent higher than it was before World War II. (All data in the Yearbook are given in live (whole or fresh round) weight for both finfish and shellfish.)

The data reflect the remarkable recovery of the world's fishing industry since the war, with Japan firmly in the lead of fishing nations. In 1948 the Japanese fishing fleet landed about 2,430,000 metric tons. By 1955 the figure had risen to 4,720,000 metric tons, some 2,000,000 tons more than the second biggest fishing nation, the United States (including Alaska) which landed 2,687,000 metric tons in 1955. U.S.S.R., with an officially-published 2,500,000 metric tons (excluding aquatic mammals) is the world's third largest fish producer.

According to the Yearbook, quoting statistics published in Communist China (mainland), that country is the fourth biggest fishing nation with an estimated 2,000,000 metric tons in 1955. Other fishing nations catching more than 1,000,000 metric tons annually are Norway (1,867,000) and the United Kingdom (1,099,700).

Table 2 - World's Fisheries Catch by Continents and Regions, 1938 and 1955

Continent or Region	1938	1955	% Increase
	(Metric Tons)		%
Africa	440,000	1,620,000	168
North America	3,150,000	3,800,000	18
South America	230,000	760,000	124
Asia	9,350,000	11,280,000	27
Europe	5,540,000	7,650,000	35
Oceania	80,000	110,000	33
U. S. S. R.	1,520,000	2,500,000	66

Note: Excludes aquatic mammals, but includes all other aquatic flora and fauna.

A considerable part of the increased fish production is being used for reduction to fish meal and solubles. In 1938 some 656,000 metric tons were used for reduction purposes. Since 1948, the tonnage has increased yearly and by 1955 had reached 1,164,000 metric tons.

Among the many interesting tables in the new Yearbook is one which gives the world catch by groups of species in 1954. This table shows that herring, sardines, anchovies, menhaden, etc., make up the largest group, and account for 7,000,000 metric tons a year or 27 percent of the grand total of 26,600,000 metric tons (live weight), while the group made up of cod, hake, haddock, etc., yields 4,200,000 or 16 percent. Fresh-water fish account for 2,600,000 metric tons (10 percent) and

mollusks for 2,500,000 (9 percent). Tunas, bonitos, and mackerels account for 1,700,000 metric tons (6 percent).

The waters of the northern hemisphere temperate zone and Arctic are the most productive, yielding 18,700,000 metric tons live weight, or about 70 percent of the world total. The tropical zones account for 4,100,000 tons (16 percent), and the southern hemisphere temperate zone for 1,400,000 metric tons (5 percent).

WHALING

JOINT JAPANESE-CHILEAN WHALING FIRM PLANS: A joint Japanese-Chilean whaling firm will be formed with the Japanese and Chilean partner companies each contributing equally to the capital stock of US$1.2 million. The new venture will not only process whales into meat, oil, and meal, but will also produce frozen fish fillets and fish oils for export. A large Chilean trading firm will handle the new firm's exports and will be its United States representative.

The Chilean concern of the new firm was established in 1954, with offices at Santiago and a plant in Coronel. The plant was built under the direction of Japanese and Danish engineers, and the machinery was supplied by a Danish firm. The plant is equipped for both the processing of whales and fish. The cost of the plant exceeded 180 million pesos (about US$360,000).

According to one of the Chilean partners, the Chilean Government will soon approve the proposed partnership between the local firm and the Japanese firm. At the present time there are three representatives of the Japanese firm in Santiago discussing final details of the partnership, states a November 28, 1956, dispatch from the United States Embassy in Santiago.

The Japanese partner concern to the new firm will lease two whale catcher boats to the joint venture, complete with crews, and will also furnish 12 technicians for the plant at Coronel. The whale catcher boats are scheduled to arrive early in 1957. The processing plant is expected to employ between 150 and 200 workers when production begins.

The report from Japan that the regulations of the International Whaling Commission will be observed was confirmed by one of the Chilean partners. As soon as the details as to the partnership are complete, three Japanese will become members of the board of directors of the firm.

JAPANESE-RUSSIAN NORTH PACIFIC FISH COMMISSION

FIRST MEETING HELD: The first meeting between the Japanese-Russian Fish Commission was scheduled to meet in Tokyo on December 30, 1956. The Soviet delegation was to be headed by A. A. Ishkov, Minister of Fisheries, and was to consist of three commissioners and eight others. The first meeting was to be held on December 30 to discuss procedures. During subsequent meetings the most important subject was to determine the total amount of salmon which the Japanese will be allowed to catch in the convention area in the 1957 season. It is reported that the Japanese will insist on a minimum of 150,000 metric tons.

The Japanese felt encouraged by the fact that the Russians sent their Minister of Fisheries and a strong delegation. Due to the high level of this delegation, the Japanese believe that negotiations will be handled expeditiously and that an agreement will be reached by the end of January 1957.

Australia

DEVELOPMENT OF NEW GUINEA FISHING INDUSTRY PLANNED: An approved plan for the development of the fishing industries in Papua and New Guinea was announced in September 1956 by the Australian Minister for Territories.

The aims of the Government are to increase shell production and exports, to reduce imports of fish, and eventually to export fish. Development of the fishing industry will increase the amount of protein food available to the indigenous inhabitants and augment their cash income from trade.

The main points of the plan, which will be implemented by the Division of Fisheries of the Territory Department of Agriculture, Stock and Fisheries are:

1. Introduction of improved fishing techniques to native fishermen, including distribution to them of fishing gear.

2. Training of native fishermen ashore and as crews of Administration vessels in all aspects of fishing.

3. Encouragement of indigenous people to organize their activities to increase their consumption and trade in fish.

4. Recruitment and training by the Administration of indigenous people as Native Fishery Assistants to assist native fishermen.

Investigation of potential fishing grounds would be continued. Commercial fishing enterprises by European and native fishermen would be encouraged where they would not conflict with village communities dependent on fishing. A trawler would be acquired by the Administration.

An overseas expert had visited the Territory and visits by other overseas experts would be arranged as required. One would advise on long-line fishing for tuna.

Other objectives of the development plan were the encouragement of fresh-water fish production, particularly in inland areas, an increase in oyster production, and investigation of local production of salt for preservation.

As fishing developed, investigations would be carried out on economic and marketing aspects and an inspection system instituted. A marine biological station would be established when appropriate. (Australian Commonwealth Director of Fisheries Fisheries Newsletter, October 1956.)

* * * * *

SCALLOP FISHERY TRENDS: The scallop beds located on Australia's east coast and discovered by shrimp fishermen out of the Queensland port of Bundaberg are reported to extend some about 80 miles, from Fraser Island to Round Hill and are 25 miles in width.

The Queensland scallops are not only a different species from the Tasmanian variety but also belong to a different family. The Tasmanian scallop belongs in the family Pectinidae and the commercial catch is made up of three species, Notovola meridionalis (Commercial), Mimachlamys asperrimus (doughboy), and Equichlamys bifrons (queen). The Queensland scallop is Amusium balloti (ballot saucer scallop), one of the family Amusiidae. This species is taken in shell sizes up to 6 inches and are reported to be faster swimmers than the Tasmanian species and for this reason are caught with shrimp trawls and not the usual scallop dredges.

The market for the Queensland scallops has been extended to Sydney, according to the Fisheries Newsletter, August 1956, of the Australian Commonwealth Director of Fisheries. Two consignments were made to that market in July 1956 and were sold readily. The frozen scallop meats were packed in 5-pound cartons (six cartons to the master), and sold for about 44-45 U. S. cents a pound for single cartons and about 42-43 cents by the master carton.

* * * * *

SPINY LOBSTER FISHERY AND EXPORT TRADE 1955/56: The catch (table 1) and value of Australia's spiny lobster fishery has grown steadily during the past nine years. The catch of whole spiny lobsters reached a peak in the 1954/55 season of 20.1 million pounds. In 1955/56 the catch dropped to 18.5 million pounds, due to adverse seather during the fishing season, but the total export dollar value (US$4.3 million) was the highest on record.

Table 1 - Australian Catch of Whole Spiny Lobsters, 1954/55 and 1955/56 Seasons

Country	1955/56	1954/55
	(1,000 Pounds)	
Australia:		
West	10,530	10,906
South	4,000	4,589
Tasmania	2,900	3,259
Victoria	614	832
New South Wales	471	545
Total	18,515	20,131

The export trade in spiny lobsters has also increased steadily (table 3) and in 1955/56 amounted to 4.4 million pounds as compared with 4.7 million the previous year and 1.6 million pounds in 1948/49.

In the 1955/56 season the average price paid for spiny lobster tails f.o.b. Australia reached the high level of US$0.93 a pound with some lots bringing as high as $1 a pound late in the season. Average prices received in the 1954/55 season were close to $0.83 a pound (Fisheries News Letter of Australia's Commonwealth Director of Fisheries, October 1956).

Table 2 - Australian Exports of Spiny Lobsters (Tails and Whole), 1948/49-1955/56 Seasons

	1955/56	1954/55	1953/54	1952/53	1951/52	1950/51	1949/50	1948/49
	(1,000 Pounds)							
Tails	4,411	4,723	4,169	3,941	3,606	2,865	2,650	1,603
Whole	295	118	66	130	54	71	93	183
Total	4,706	4,841	4,235	4,071	3,660	2,936	2,743	1,786

Table 3 - Australian Exports 1/ of Spiny Lobster Tails by States, 1948/49-1955/56 Seasons

Seasons	Australia		Tasmania	Total	Dollar Earnings
	West	South			
	(1,000 Pounds)				(US$1,000)
1955/56	3,505	877	30	4,412	4,300
1954/55	3,601	1,108	14	4,723	4,200
1953/54	3,244	828	98	4,170	3,500
1952/53	2,823	956	162	3,941	3,220
1951/52	3,033	556	17	3,606	2,625
1950/51	2,221	537	107	2,865	1,850
1949/50	2,005	614	31	2,650	1,360
1948/49	1,215	324	64	1,603	1,000

1/ Exports of whole spiny lobsters not included.

Canada

DIFFICULTIES ENCOUNTERED IN GRADING NEW BRUNSWICK SMELT: During the years when two-year old smelt dominated the catches from the Miramichi River area of New Brunswick, Canada, the difficulties encountered in grading are increased, according to a report by a biologist of the Fisheries Research Board of Canada (Progress Reports of the Atlantic Coast Station, No. 65, Oct. 1956). Packers and inspectors claim (there are no actual records on the subject) that the 1949/50, 1951/52, and 1954/55 seasons were particularly bad in this respect while 1952/53 and 1953/54 were quite good.

Since 1939, as an aid in marketing, smelt have been packed in three grades, and more recently in four grades, according to length. The packers can usually judge the grade of most of the fish accurately. However, difficulty arises when many smelt are within $\frac{1}{4}$ inch of the limit between grades. Inspectors will not pass boxes of smelt when more than 5 percent of the fish are smaller than the proper grade.

The four grades now established by regulation are based on length measured from the tip of the snout to the end of the backbone at the round of the tail. These grades are: small, under 4 inches; medium or No. 2, 4 to $5\frac{1}{2}$ inches; No. 1 $5\frac{1}{2}$ to 7 inches; and extras, over 7 inches.

A study of the ages of the fish in the commercial catches and the size ranges of each age group shows how the grading trouble arises.

Between grades No. 1 and extras only a few of the fish are ever within $\frac{1}{4}$ inch of the limit, so mistakes in sorting are not important. Even if all the fish that were within $\frac{1}{4}$ inch of the grade limit were put in the higher grade, the number of undersized fish would be not more than 5 percent in all but one of the last seven commercial seasons.

Table 1 - Total Catches and Sampling Data for Miramichi Smelt Showing Proportion of Fish Within $\frac{1}{2}$ Inch (Either Side) of the Limit Between Number One and Extra Grade Smelt and Medium and Number One Grade Smelt for the 1948/49 to 1954/55 Commercial Seasons

Commercial Season	Total Miramichi Catch	Numbers Sampled	Proportion Within $\frac{1}{4}$ Inch of Limit Between	
			Number One And Extra	Medium and Number One
	1,000 Lbs.		.....(Percent).....	
1954/55	2,058	7,022	5	22
1953/54	1,183	5,106	11	16
1952/53	1,624	4,922	10	13
1951/52	854	5,647	4	25
1950/51	2,178	4,347	7	20
1949/50	1,178	5,596	2	28
1948/49	2,013	1,342	8	18

However, between grades medium and No. 1 (table 1) there are always many fish within $\frac{1}{4}$ inch of the limit. In the three bad seasons (1949/50, 1951/52, and 1954/55) from 22-28 percent of the catch was within $\frac{1}{4}$ inch of the limit. Real trouble occurred in packing during these seasons because every third or fourth fish was in the hard-to-grade group. On the other hand, there was little difficulty in 1952/53 and 1953/54. In these years there were only 13 percent and 16 percent of such fish in the catch. The 1948/49 and 1950/51 seasons showed only moderate difficulty, with 18 percent and 20 percent of borderline fish.

The difficulty is not necessarily related to the total catch, for in the three bad years the catch ranged from almost the highest in 1954/55 (2.2 million pounds) to the lowest of the seven seasons in 1951/52 (about 0.9 million pounds).

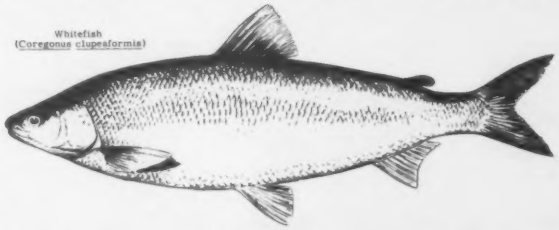
The most important fish in the catch are those nearing 2, 3, and 4 years of age and the 2's generally make up most of the catch (table 2). The 2's made up most of such fish between mediums and No. 1 and the 3's those between No. 1 and extras. The commonest size of the 2-year-old fish is usually close to the grade limit between mediums and number ones. Sampling of the catches for seven seasons demonstrated that grading difficulties were great when 2's made up a greater than average part of the catch. In the three seasons in which grading problems were most severe, the 2-year old fish made up 66 percent, 81 percent, and 70 percent of the catch respectively. In 1949/50 some 3-year olds were also near this grade limit, raising the total considerably above that of the 2-year olds alone. This is uncommon and was caused by these 3's (1947 hatch) growing more slowly than usual.

Table 2 - Percentage of "2-year-olds" in the Miramichi Smelt Catches for the 1948/49 to the 1954/55 Commercial Seasons

1954/55	1953/54	1952/53	1951/52	1950/51	1949/50	1948/49
(Percent)						
70	52	48	81	62	66	54

* * * * *

LAKE WHITEFISH: Half a dozen or so varieties of whitefish have been recorded from Canadian inland waters, but the common or lake whitefish is the only one of commercial importance in Canada's fisheries. It is found in Manitoba, Ontario, and Saskatchewan. Large landings are also made from Alberta waters and from Great Slave Lake, N. W. T. Some catches are taken by the fishermen of Quebec, New Brunswick, and the Yukon Territory. The whitefish belongs to the family Coregonidae, suborder "Salmonoidea," and thus is related to Atlantic and Pacific salmon, speckled and rainbow trout, tullibee, ciscoes or lake herring and several other fish.



In coloring the whitefish is olivaceous on the upper part of the body, with whitish sides and under portions. The lower fins may be dusky. The tail fin is deeply forked. Head and mouth are comparatively small, the scales large. The mouth is subterminal, distinguishing it from other members of the family. Some adult whitefish have a fleshy bump at the shoulders. So far as weight and body measurements are concerned, it is not possible to give exact averages for any species of fish, but the mature whitefish averages 18 inches in length and weighs about 2.5 pounds. This size makes up 75 percent or more of the catch.

The whitefish lives upon minute mollusks and crustaceans and other small aquatic creatures. Its summer habitat is the deeper, colder parts of the lakes, from which they move into more shallow water at spawning time. The spawning time varies somewhat in different years depending on the conditions of the weather and also with respect to the locality. Spawning begins in the latter part of October and continues into the first week of December. In Great Slave Lake it may continue into January in some areas.

Whitefish generally reach maturity in the third and fourth year. They mature in the eighth year in lakes where the average water temperature is low. A full-grown individual deposits from 10,000 to 75,000 eggs, depending on the fish's size.

The Northwest Territories, Manitoba, Ontario, and Saskatchewan are the main Canadian producers of whitefish. Commercial fishing for whitefish was undertaken at Great Slave Lake in the Northwest Territories for the first time in 1945.

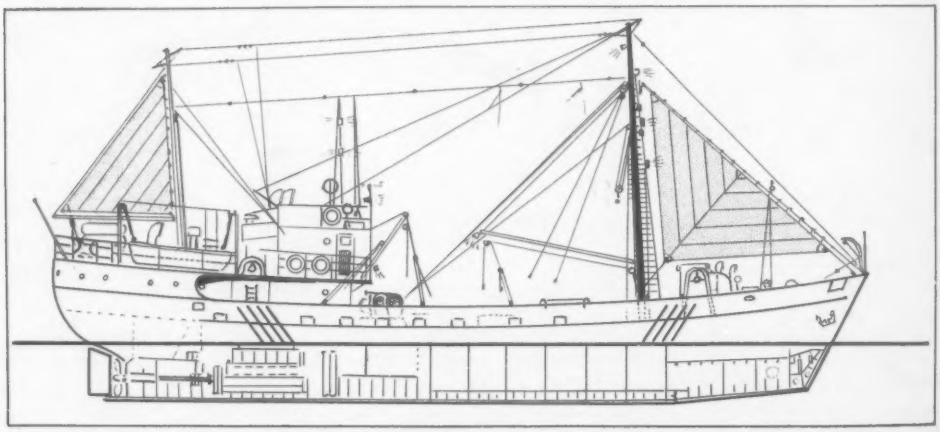
Gill-netting is the chief method used in fishing for whitefish, although stationary pound nets and trap nets are also used in some areas. In areas where winter fishing is done, and in the Prairie Provinces, the bigger part of the whitefish catch is usually taken in the winter season, the gill nets being set under the ice. The hook-and-line method of fishing for them is followed in commercial operations in Lake Simcoe, Ontario.

Virtually all of the whitefish marketed by Canadian fishermen is sold in the fresh and frozen forms, though small quantities are smoked. The catch is sold in Canada and the United States, most of it in the latter country.

The fishery resources of the Great Lakes are now under joint scientific investigation by Canada and the United States. This investigation, and an augmented program to rid the lakes of the predatory sea lamprey, are the responsibility of the International Great Lakes Fisheries Commission. (Trade News, October 1956, of Canadian Department of Fisheries.)

German Democratic Republic

SHIPYARD BUILDS TRAWLERS ON ASSEMBLY-LINE METHODS: The East German port of Stralsund, which lies on the Baltic seaboard about 20 miles northeast of Rostock, is nowadays the scene of one of the most interesting examples of mass production of fishing vessels in Europe.



Profile drawing of the 128-foot trawler constructed on assembly-line methods in East Germany.

Some eight years ago the yard, which is now turning out 100 fishing vessels a year, did not even exist. It now employs 6,000 men. Majority of these mass-produced craft are exported to Poland, Soviet Russia, and China at a cost of US$232,400 each, and it was to satisfy the big demands of these countries for fishing craft that the present method of mass production was evolved.

Full technical details of this method are not available, but it appears that, as is of course the practice in many yards in the non-communist countries, building is done in sections. Apparently the whole production process is along the lines of an automobile factory. The buildings on the outside perimeter prepare the parts for each section; those further inward are putting the parts together; the sections are then fed into a main building where they are assembled on three lines.

The final product, which is offered as a 400 horsepower fishing lugger, is registered in the highest class of the Maritime Register of the U.S.S.R. The yard states that they are very anxious to contact the Western world to draw attention to their vessels. It is anticipated that production will increase to 130 vessels a year.

Principal dimensions of the lugger are as follows: length over-all 128 ft. 3 in.; maximum breadth 24 ft. 2 in.; maximum draught 13 ft. 7 in.; power output 400 hp.; speed at displacement of 434.93 tons, 10 knots.

The vessel is a dual-purpose, steel-built drifter-trawler, designed for deep-sea work. There is 1-, 2-, and 4-man cabin accommodations fore and aft for a crew of 26, although the normal complement would be 23. Fuel-oil capacity provides for 21 days of uninterupted operation of the main engine at full power, as well as for 12 hours a day running of the auxiliaries over the same period.

Diesel power is provided by a direct-reversing, 4-stroke type 148-unit engine, developing 400 b.h.p. at 275 r.p.m. Reports say that they are "sea-kindly" and good fishing ships (World Fishing, October 1956).

German Federal Republic

CANNED SARDINE MARKET: West Germany is reported to be the biggest market in the world for canned sardines. Germany has no sardine industry of its own and imports all the sardines it consumes from Portugal, France, French Morocco, and Yugoslavia. Total imports during the past two years (table 1) averaged about 12,500 metric tons each year at a value of approximately US$6.2 million, an August 20 dispatch from the United States Consul General in Bremen reports.

Table 1 - German Federal Republic Canned Sardines (Sardina pilchardus and Culpea pilchardus), 1954-1955

Country of Origin	Quantity	Value		Quantity	Value	
	Metric Tons	DM 1,000	US$ 1,000	Metric Tons	DM 1,000	US$ 1,000
France	2.3	10	2	8.7	35	8
Yugoslavia	324.0	602	143	864.4	1,480	352
Portugal	11,717.1	24,539	5,840	9,624.6	20,960	4,988
Spain	7.7	14	3	17.5	38	9
French Morocco	386.0	844	201	2,378.6	3,803	905
Spanish Morocco	18.9	37	9	34.2	73	17
Others	-	-	-	2.2	3	1
Totals	12,456.0	26,046	6,198	12,930.2	26,392	6,280

Note: Values converted at rate of 1DM = US$0.238

An unusual situation prevails in Germany with regard to the importation and marketing of sardines. According to several spokesmen of the sardine import trade, the marketing of sardines in Germany is still subject to the stipulation that Germany shall use the designation "sardines" only for the species Sardina pilchardus and Clupea pilchardus caught in Mediterranean waters and along the European Atlantic coast up to and including the English Channel. This geographical limitation plus

the zoological definition of a "sardine" effectively limits West German imports of sardines to the present supplier countries.

West German importers have stated firmly that they definitely do not wish to import sardines and market them as such in Germany unless the sardines are actually from the area specified. These representatives furthermore frankly declared that they are not interested at all in a change in the present situation. During the last thirty years or so the designation "sardines" has become identified in the mind of the German consumer with a definite type product. Importers say that they do not want to endanger their carefully developed present market by introducing unfamiliar types of sardines.

Germany has a sizable domestic herring industry. In 1955 the total West German herring catch amounted to about 335,000 tons. Approximately half of this amount was canned--some 105,000 tons. About 40 percent of this production would compete with any product imported as canned herring. The remaining volume represents a so-called semi-preserved product, mostly the bigger type of filleted and marinated herring packed in a great variety of brines and sauces.

West German importers seriously doubt whether the United States industries could compete pricewise with the German product. The factory price for a $3\frac{1}{4}$-ounce flat can of small herring packed in natural oil is 26 Pfennigs (6 U. S. cents). This retails at 36-40 Pfennigs ($8\frac{1}{2}$-$9\frac{1}{2}$ U. S. cents) a can. In other words, to meet the domestic price, the United States product must not cost more than approximately 6 cents a can, c.i.f. West German sea port. Besides shipping costs this price would have to cover a 14-percent import duty plus a 6-percent compensation tax. German importers calculate that after the deduction of the above charges the remaining amount (about 4¢) represents about half the price at which United States fish canners are now selling their product in the United States. It has further been pointed out that, if a market were to be created for the United States product, the price quotations, at least for several of the pilot orders, would have to be lower still to provide an incentive for the importer to embark upon such an enterprise and to win the German consumer over to the new product.

Another impediment to the importation of canned herring is the fact that their purchase abroad has not yet been liberalized. Individual licenses within import quotas set by the Federal Government would still be required. As far as could be determined such quotas have never been allowed by the government which is trying to protect the domestic industry. Such protection from foreign competition is claimed to be indispensable because of the division of Germany. The canning industry, concentrated mostly in West Germany, suffered the loss of a large part of the domestic market in the East Zone.

Only 102 metric tons of canned sardines were exported by the German Federal Republic in 1955 as compared with 78 tons in 1954, mostly to the Belgium Congo and Austria.

Iceland

BECOMES PARTY TO INTERNATIONAL WHALING CONVENTION: On November 23, 1956, the Ambassador of Iceland to the United States signed the protocol to the International Whaling Convention in Washington, D. C., and deposited the ratification with the appropriate officials. This will make Iceland a party to the rules and regulations set up for the conservation of whales.

Iran

JAPANESE-IRANIAN FISHING AND MARKETING ENTERPRISE IN PERSIAN GULF AND GULF OF OMAN: Important development of Iran's marine food resources in the Persian Gulf and Gulf of Oman is anticipated following the approaching formation of a new company financed by the Seven Year Plan Organization and private Japanese capital. The enterprise plans to create new sources of foreign exchange through export trade and to fill the need for an augmented animal protein diet for the people of southern Iran. It will be complementary to a project begun a couple of years by the Plan Organization and the United States Operations Mission in Iran to rehabilitate the Government cannery at Bandar Abbas.

An Iranian-Japanese fishing and marketing venture in the waters bordering Iran's southern coastline is expected soon to begin deep-sea commercial operations after almost two years of study and trial fishing by a private Japanese enterprise. Forecasting sound opportunities for the development of foreign exchange for Iran through export trade and the provision of needed additional animal protein foods for the internal Iranian market, the Japanese company's reports led to the signing of a basic agreement on June 17, 1956, with Iran's Seven Year Plan Organization.

This agreement provides for the establishment of a joint stock company with headquarters in Abadan. Initial capitalization is to be 30 million rials (US$400,000), two-thirds to be subscribed by the Plan Organization and one-third by the Japanese company. After the third year of operation, the capital shall be increased by another 30 million rials ($400,000); and, after the fifth year, by an additional 30 million rials. Management of the joint company will be vested in a five-man board of directors: three Iranians; two Japanese. The president of the board will be Iranian and the managing director, Japanese. Fishing vessel crews and technicians will be largely supplied by the Japanese company. Actual Plan Organization participation in the company will be effected by the Chemical Industries Section, points out a December 26, 1956, dispatch from the United States Embassy at Tehran.

The company is authorized under the basic agreement to exploit fish and other edible marine life in the Persian Gulf and the Gulf of Oman, as well as to process and market its catch in Iran and abroad. Also provided for is the ownership and operation of fishing vessels, canning factories, refrigeration and ice-making plants, and related endeavors.

The Iranian market will probably be limited initially to the areas bordering the Persian Gulf, particularly in the Abadan area, where animal protein foods are not now in good supply. Export possibilities in much of the Middle East are good, according to one Japanese source. The sale of shrimp in the United States market is also believed feasible.

The key to the venture's success is stated to lie in the use of modern equipment and processing techniques, with emphasis on quick freezing of the catch on the fishing vessel itself and adequate cold-storage facilities at Abadan. The earlier studies of the Japanese company indicated that major attention should also be given to improving the present method of fish marketing along the Persian Gulf coastal areas.

Only one vessel, the Tatsuta Maru, property of the Japanese company, is now available for the operations of the new company. The ship, which carried on the trial studies, is described as a 550-ton refrigerated trawler, with a quick freezing capacity of 10 tons a day. The potential monthly catch with this equipment is estimated at from 100 to 200 metric tons a month. Additional vessels and equipment will be brought into operation following registration of the company and development of foreign and domestic markets.

The basic agreement does not give the Persian Gulf Fisheries Company a monopoly of fishing, marketing, or any other associated fields. In principal, however, equipment not available in Iran will be procured from Japan, provided Japanese prices are "not disadvantageous."

Japan

FISHERIES TECHNICIANS HOLD CONFERENCE: The Japanese Agriculture and Fisheries Technical Council held a conference beginning December 3, 1956, to discuss the various problems in connection with the Japanese fishing industry. Among the subjects under discussion were: (1) the reasons for the decline in the sardine catch in the postwar period compared to prewar catches and the results of research carried out with respect to the problems; (2) deep-sea tuna fishing and the problems raised by the restrictions imposed on albacore; (3) salmon fishing in the North Pacific and problems raised by Soviet restrictions; (4) matters involving the North Pacific Fisheries Agreement, including migration of salmon and distribution of species; (5) the forthcoming negotiations under the Russian-Japanese salmon fishing agreement.

* * * * *

FROZEN SHRIMP IMPORTS FROM RED CHINA APPROVED: An application by the four leading Japanese fishing firms to import frozen shrimp from Communist China was approved in December 1956 by the Japanese Ministry of International Trade and Industry. The shrimp will be imported on a barter basis, 2,300 cases of Japanese king crab meat in exchange for 100 tons of Chinese frozen shrimp. The Japanese government approved the application with the proviso that the shrimp be packed in blocks of 1.1 pounds and 4.4 pounds and prepared in a specified manner. These stipulations were made in order to facilitate re-export. The Ministry was reported anxious to prevent the re-export of these frozen shrimp to the United States, states a December 14, 1956, dispatch from the United States Embassy in Tokyo.

* * * * *

NATURAL FLUCTUATIONS IN POPULATIONS OF PRIME IMPORTANCE IN TUNA FISHERIES CLAIMS BIOLOGIST: Natural fluctuations in the tuna populations are of prime importance and fishing has had little permanent effect on the stocks, according to a talk given by Director Hiroshi Nakamura of the Nankai Regional Fisheries Research Laboratory at the Kanagawa Fisheries Experiment Station on August 14, 1956. This evidently represents a different point of view from the panel discussion held at Misaki, Japan, on August 23, 1956, where industry members considered the problems which might be taken up by the Tuna Fishery Investigative Committee recently established by the Japanese Fisheries Agency, and where the gist of the discussion was that lower daily catches of tuna experienced by Japanese fishing vessels in recent years might be an indication of overfishing, and that regulation might be in order some day. (See Commercial Fisheries Review, November 1956, p. 90).

In his discussion, Nakamura comments regarding the close relationship between currents and the fish faunas and points out documented instances of major changes in tuna populations, changes that could not possibly be ascribed to fishing. The final comments of Nakamura deal with forecasting tuna abundance.

Some excerpts from Nakamura's talk follow:

... If we may make some very rough approximations about the Pacific Ocean,

a. In the area where the North Pacific Current, that is the Kuroshio, is flowing to the eastward, there are fishing grounds mainly for albacore and bigeye with striped marlin and broadbill swordfish also taken.

b. In the area of the North Equatorial Current lying to the south, the fishing conditions are not clearly defined by or centered around any particular species, but if pressed, we might say that it is a fishing ground for a mixture of striped marlin, black marlin, and yellowfin. However, bigeye are abundant centered along the northern and southern boundaries of current system, and it is an important fishing ground for medium-sized vessels. This area is not a very clearly defined fishing ground, but it is thought to have an important significance as a spawning or nursery ground, and young of the tunas, spearfishes, and skipjack appear to be distributed there.

c. Next to the south is the Equatorial Countercurrent area where, as you know, the main catch is yellowfin with a mixture of bigeye and black marlin.

d. Moving into the South Equatorial Current next on the south, the northern part is a fishing ground on which yellowfin are extremely abundant. However, from the vicinity of 10° S. albacore suddenly become numerous. Until recently it was not known that there was a current boundary in this vicinity, but judging from the albacore fishing conditions we postulated that there must be a current boundary there. With the cooperation of the Daifuji Maru in carrying out oceanographic observations in this region it was found that during the season of northerly winds there is a clearly marked current boundary in the vicinity of 10° S. and it has been established that our hypothesis was correct. However, with the season of southerly winds this boundary fades out, and at the same time the albacore begin to be taken more to the northward.

The foregoing is the situation in the Pacific area and a similar situation obtains in the Indian Ocean, with each of the current systems forming a fishing ground of different characteristics.

To summarize the above,

a. Each current system is a fishing ground with its own characteristics, and when we cross the current boundaries the composition of the catch differs, or if the same species are taken, their sizes are different.

b. Consequently the current boundaries are for the fish like national borders which they cannot cross freely, and thus they are of such character as to restrain the distribution and migrations of the tunas and spearfishes.

Having gone this far, I am sure that you have all noticed a contradiction in what I have said. That is, I have stated on the one hand that the current boundaries are like national borders, which restrain the distribution and movements of the tunas and spearfishes, and at the same time I said that fish of the same species but of different sizes are taken in different current systems. If we say that the size of the fish differs with the current system, then this naturally means that there must be an interchange of fish between current systems.

I think, however, that I can eliminate this contradiction by adding the postscript that "while the fish remain in the same ecological state they do not cross the current boundaries." To put it in little more complicated terms, this means that "for the tunas and spearfishes the sea areas which are adapted to various ecological states are in different current systems and they live separately in different current systems according to their ecological state."...

It looks as if most of the tunas and spearfishes spawn throughout the year in tropical waters, but it is interesting to note that they seem to cross the current boundaries from one current system into another mainly at certain limited periods... .

In waters of high latitudes, which in some seasons are completely outside the area of distribution of the tunas, the fishing seasons are clearly marked, but in tropical waters the fishing seasons are not clear. For this reason it is easy to overlook the existence of fishing seasons in the tropical waters, but in actuality they are, as I have just said, definitely present, and every half year there is a large-scale exchange of schools of fish and a change in the character of the population, and this also causes a change in abundance.

Now if we again look at the matter of the movements of fish, it is thought that we can divide them broadly into two cases. The first is the case of movements within one current system and the second is the case of movement from one current system into another. The first may be called migration while in the same ecological state, and the second may be called migration accompanying a change in ecological state. In the first case the fish themselves are probably moving too, but mainly it is controlled by seasonal developments within the current system which is their biological envirnoment, whereas in the second case we may consider it a positive movement of the fish themselves. ...

Thus it is a mistake to say simply that the fishing is not as good as it was at some previous time without taking seasonal changes in the fish's movements into consideration and therefore conclude that the fish have grown scarcer.

Now the second case is that where the tuna have actually become fewer. We know of two or three examples of this sort. Our basis thinking with regard to this problem is to determine whether the reason for the decrease is one which can

be regulated by human power or whether it is due to natural conditions which are beyond human conditions which are beyond human control. If it is the first, then all we have to do is take positive action to remove the causes which interfere with the increase and maintenance of the resource. If it is the latter, the tuna fishery must establish itself in a form which will conform to these natural fluctuations. ...

If we take a combined view of the pattern of fluctuations in the quantity of the resources of black tuna, yellowfin, albacore, and bigeye, it is thought to be not far wrong to consider that with the present scale of the fishery the species which are going to increase regardless of how many are caught and those which are going to decrease will decrease even if they are not caught at all. Of course, if the scale of the fishery becomes much larger and if extremely efficient fishing methods appear, the story will be different, but if the fish which are going to increase do so despite fishing mortality, and if those which are going to decrease do so even though they are not fished, this means that the fluctuations in the resource are controlled by nature and that human activity need not be considered the causative factor. If this is the case, then the tuna fisheries must establish an operating regime which will conform to natural fluctuations.

Now we come to the question of how a type of organization can be developed that will conform to the natural fluctuations. I can think of no other way than to collect persistently through many years data on the basis of which we can clarify the question of whether or not there is any law or regularity to these natural fluctuations. If there were such regularity, it would probably be cyclical, and since it does not appear likely that such a secularity will be restricted to a single species in its appearance, I think that it will be easiest to grasp and the danger of falling into errors will be slightest if we take a synthetic view of all of the large tunas, spearfishes, and the skipjack as a whole. ...

We are at present putting together the 1955 edition of the charts of average year's fishing conditions based on data which we have received from you. I know that you have been urging our investigators in the markets to organize the data as early as possible, and with the whole year of 1957 as a period of preparation we are planning and hoping to begin to put out forecasts and news flashes on the fishing conditions beginning in 1958. The object of these forecasts will be to enable the fishery to conform to natural conditions. This will be the first time that we have undertaken this kind of work and since there appears to be no chance for oceanographic investigations covering the whole broad expanse of the Indian and Pacific oceans, the only method we will have for preparing these forecasts is to deduce the changes in oceanographic conditions from the reports on the fishing conditions obtained from you fishermen and then on that basis to make our predictions of the fishing conditions. If we can get you to write up the reports which we need on fishing conditions on your way back to port from the fishing grounds, and if you will turn them over to our investigators or put them in the mail as soon as you get into port, our small staff will be greatly aided and the preparation of the forecasts and news flashes will go smoothly.

Now once this work has been started, it is expected that there will be many defects in the forecasts, since it is our first attempt at this type of work, and there probably will be cases in which the forecasts will not be useful for their intended purpose, but the improvement in the quality of the forecasts will depend upon your cooperation... .

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SALMON EXPORTS TO THE UNITED STATES INCREASED: The short pack of canned salmon by the United States and Canada has resulted in a strong demand for the Japanese pack and earlier estimates for 1956 exports have been revised by the Japanese Salmon Sales Company, the sole export agent. Exports to these countries originally estimated at 535,000 cases (48 1-lb. cans), have been revised upwards to 700,000 cases. The additional exports were subtracted from the original allotment made to countries other than the United States, Canada, and the United Kingdom.

The United Kingdom contracted for only 140,000 cases of Japanese canned salmon from the 1956 pack out of an allotment of 480,000 cases. The delay is attributed to the fact that negotiations on the renewal of the United Kingdom-Japan Trade Agreement were still in progress when this report was made. The United Kingdom was not granting import licenses for Japanese canned salmon pending the completion of the negotiations. Canned salmon figures heavily in this trade agreement.

Malaya

IMPORT DUTIES INCREASED FOR SOME FISHERY PRODUCTS: The list of Malayan imports on which higher rates of duty were levied on November 7, 1956, included the following fishery products:

Item	Commonwealth Countries		Other, Including U. S.	
	Old Rate	New Rate	Old Rate	New Rate
	(Percent Ad Valorem)			
Salmon, canned (red, blue, black or or silver, sockeye	7½	15	free	7½
Fish maws and shark fins	10	20	free	10

Mexico

SHRIMP FISHERY TRENDS, 1956: Landings of shrimp from the offshore grounds at west coast Mexican ports in 1956 was estimated about one-third less than the record catch for 1955. Although the catch declined, higher prices limited the loss in the 1956 ex-vessel value to only 10 percent as compared to that of the previous year

The inshore shrimp fishery on the West Coast was a failure in 1956 due, it is believed, to light rainfall on the Pacific mountain slopes. The total production for this fishery was expected to be about 120 metric tons or less, a decline of about 60 percent from the 1955 season.

The shrimp catch on the East Coast was expected to exceed the 1955 catch slightly and the prospects for further increases in 1957 are good. Due to lower catches on the West Coast during the last quarter of 1956, it is likely that this trend will continue into 1957 and substantially lower the 1957 catch for the West Coast.

Mexican shrimp exports during 1956 were estimated at over 50 million pounds (headless) as compared with 46 million pounds in 1955. The value of the 1956 record shrimp exports was expected to exceed US$25 million. (United States Embassy, Mexico, dispatch dated January 9 and United States Consul, Nogales, dispatch dated January 2

The peak fishing season at Salina Cruz will probably start earlier than usual in 1957. Normally, trawlers from Mazatlan and Guaymas do not begin moving south to Salina Cruz until early February and remain until late April or May. This season five shrimp trawlers from Ciudad del Carmen were due to arrive in Salina Cruz in late December 1956, and additional boats from Mazatlan and Guaymas some time in January. The arrival of the Carmen boats marks the first season that trawlers from the Gulf of Mexico moved to the Pacific to fish the winter-spring run of shrimp near Salina Cruz.

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NEW SHRIMP FREEZING AND ICE PLANT: A new shrimp freezing and ice making plant was being constructed in Salina Cruz, Oaxaca, Mexico. The plant, with a daily capacity of 15,000 pounds of frozen shrimp and 10 tons of ice, was expected to begin operations some time in January 1957. With the new plant, Salina

Cruz has three freezers with a daily capacity of 45,000 pounds of shrimp and 120 tons of ice, reports the United States Embassy in Mexico City (December 20, 1956).

Norway

1957 WINTER HERRING FISHING SEASON OPENS: During December 1956, Norwegian fishermen were preparing for the winter herring fishery that usually begins in January. A catch of more than one million metric tons is expected to be taken by the 30,000 fishermen and 2,700 boats that participate in this fishery.

The Norwegian research ship G. O. Sars was at sea in December to track the movements of the vast schools of herring which move into the Norwegian coast every winter. The Norwegian fishery scientists aboard the research vessel will determine exactly the time and place for the appearance of the herring schools (Fishing News, December 21, 1956).

A report late in January pointed out that stormy weather kept vessels from going after the herring shoals off Norway's west coast and up through January 24 landings were light. (News of Norway, January 24).

Pakistan

EXPLORATORY FISHING RESUMED: The exploratory fishing program in the waters off the coast of West Pakistan was resumed on the termination of the monsoon in September 1956. Special stress is being laid on the exploration of the shrimp grounds. In addition to otter trawls, which were being used during the last few years, the use of purse seins during the current season is also planned.

In previous years existence of schools of various fishes was reported by the exploratory vessels. (Current Affairs Bulletin, November 1956, of the Indo-Pacific Fisheries Council.)

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ICA AID FOR FISHERIES: For the fiscal year 1956/57 US$525,000 and US$315,000, respectively, were allocated by the U. S. International Cooperation Administration for importing nylon twine for net making and 50 marine engines for mechanizing indigenous fishing craft. These commodities are for distribution to the fishing community on easy installment payments. These measures are in continuation of similar measures taken in 1955/56.

Peru

ANCHOVY FISH MEAL PLANT ADDITIONS OR ENLARGEMENT PROHIBITED: In a Decree dated December 1, 1956, and effective January 1, 1957, no new authorizations will be granted in Peru for the establishment of new fish meal plants or the enlargement of exisiting plants that use anchovies for reduction. The prohibition will be effective until Peruvian fisheries authorities can devise adequate measures to insure the future productivity of anchovy stocks, states a December 21, 1956, dispatch from the United States Embassy in Lima.

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THREE WHALERS PURCHASED FROM NORWAY ARRIVED: The three whale-catcher vessels purchased in Norway by the joint Peruvian-United States whale processing firm arrived at the port of Callao on November 7, 1956, from Sandefjord, Norway. The three vessels have been registered in Peru as the Don Juan, Don Tomas, and the Don Christobal and are at present manned by Norwegian crews.

The plant at Paita in the Northern part of Peru where the vessels will be based, was under construction. Operations were expected to begin early in 1957, states a December 13, 1956, dispatch from the United States Embassy in Lima.

Note: See Commercial Fisheries Review, January (1957) p. 80.

South-West Africa

PILCHARD SEASON FOR 1956 ENDED IN OCTOBER: Although the pilchard season in Walvis Bay, South-West Africa, remained open until the end of October 1956, reliable sources reported that commercial fishing for pilchards in the area had come to an end early in October.

The season was considered by the trade to have been a successful and better-than-average one and fish factories in the area closed in October as they caught their quota for the year. It is understood that some factories in Walvis Bay did more canning in the 1956 season than ever before. The average production of fish oil during the season was around 15 gallons per ton; the maximum 29 gallons per metric ton, according to an October 20 United States consular dispatch from Cape Town.

Union of South Africa

BROWN BREAD WITH FISH-MEAL PREMIX ON THE MARKET: The South African Government-backed project to develop a fish meal protein additive to enrich bread flours was scheduled to be tested beginning November 1, 1956, in all bakeries in the Western Cape. The new enriched brown bread, with fish-meal "premix" added, will be on sale in all these outlets. The premix is made up of 2.5 ounces of fish (maasbanker) meat equivalent, 2.5 ounces of skim milk, and $\frac{1}{4}$ ounce of fat for each two-pound loaf of bread. Calcium acetate also has been added to counteract any tendency to "ropiness" and make the bread last longer. The pilot plant operated by the Government and located at Simonstown will process one ton of fish meal a day for distribution to the bakeries in the Western Cape. All enriched brown bread baked in the Western Province will have the fish meal premix added.

The development of a tasteless, ordorless fish-meal premix, a special project of the Department of Health of the Union Government, has come after four years of experimentation and an expenditure of £25,000 (US$70,000). The Secretary for Nutrition of the South African Government recently stated to a Cape Times reporter that the new fish-meal premix would add important animal protein to the diets of South Africans. He added that a person eating between 6 and 8 slices of bread daily would get from 15 to 20 percent of his animal protein needs from the bread alone.

Reports are that consumption in Cape Town of enriched brown bread is one loaf for every two loaves of other types It is hoped that consumption of the brown bread can be increased.

If the new bread proves popular in the Western Cape, the premix will be used all over the Union. Should this prove to be the case, it is estimated that about 600 tons of the premix will be needed monthly, according to an October 29, 1956 dispatch from the United States Consul in Cape Town.

Enriched bread with the special fish-meal premix is said to be subsidized by the Union Government to the amount of £900,000 ($2,520,000), in addition to a general subsidy of £8,000,000 ($22,400,000) for bread.

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PILCHARD-MAASBANKER FISHERY FOR 1956 WORST ON RECORD: Even the widespread introduction of echo-sounders will not prevent the 1956 season on Union of South Africa's west coast from going down as one of the worst in the short history of the pilchard and maasbanker (jack mackerel) fishery. After reasonably good catches during July and August, the returns for September 1956 showed a sharp drop again.

The catch of pilchards and maasbanker for the first 9 months of 1956 totaled only 127,000 metric tons or just over half the 250,000-ton annual quota. Reports for October 1956 showed that that month was even worse than September.

Analysis of the figures to date shows that there has been no substantial drop in the pilchard catch, but there has been a drastic reduction in the maasbanker catch. The South African Shipping News and Fishing Industry Review of November 1956 reports.

U.S.S.R.

EXPERIMENTAL AND COMMERCIAL FISHING WITH ELECTRIC LIGHT: The use of electric light and fish pumps in the fisheries of Soviet Russia was described by P. G. Borisov in a paper presented at the last meeting of the Conseil International pour l'Exploration de la Mer in 1956. Some excerpts from the paper follow:

In the summer of 1945 we started our investigations in the Caspian Sea with electrical light as a stimulant to attract fish. We kept on conducting our investigations and later on transferred them to other seas--the Black and the Baltic--and to Lakes Pereslavl and Choud.

The earliest investigations carried out in the Caspian Sea indicated that the light of a common electric lamp (white light) is the most effective for attracting fish (sprat) at night, as compared to red, orange, yellow, green, and blue light; yellow light was found to be next to white in its effectiveness. In the experiments, a lamp with a waterproof socket was suspended by a waterproof cable at various depths.

In 1947 the work with electrical light in the Caspian Sea showed that more powerful electric lamps (1,000-1,500 watts) give better results in attracting sprat at night into the lighted area, which in its turn results in a bigger catch. A decline in catch was registered when the power of the lamp decreased.

Alongside with this a question was settled which is of great importance for fishing in the Caspian Sea--the question of vertical distribution of sprat on fishing grounds. It turned out that in summer (August) when the water in the upper layers becomes very warm sprat move to deeper layers where they cannot be reached by shallow purse seines. Fishing with electrical light at great depths during this period appeared to be very successful.

At the same time we described methods of commercial fishing for sprat with the help of electrical light. Three methods were described: fishing with conical nets, lift nets, and purse seines.

A special 1,000-watt lamp with the upper part of the bulb having a reflecting surface was proposed for purse seining. The lamp is inserted into a cupola-shaped buoy, the socket downwards, and is connected to an electric generator with the help of a waterproof cable. It may be kept at any distance from the fishing boat (100-200 meters or 328-656 feet). During fishing operations the boat either casts anchor or drifts. There are various designs of lift nets. The lift net used by our fishing boats was a rectangular (7 to 5 meters or 23 to 16 feet) cotton netting with a mesh size of 7-8 mm., lowered and lifted by booms. A common electrical lamp of 500 watts was attached to the center of the netting and the gear was lowered to a desired depth.

Since 1951 conical nets have been widely used in the Caspian Sea. A cone-shaped cotton netting (thread No. 34/6) with a mesh size of 7-8 mm. is fastened at its base (the upper part of the net) to a metal ring three meters (about 10 feet) in diameter. The vortex of the cone (the lower part of the net) is furnished with a metal lock which serves not only for "brailing" the fish but is a kind of sinker keeping the gear in the water in a proper (strictly vertical) position. An electric lamp of 1,000 to 1,500 watts with a waterproof socket and cable is fixed in the center of the ring with the bulb directed upwards. The length of the cable depends on the depth of fishing. In June sprat is fished in the Caspian Sea at depths of 15 to 20 meters (49 to 66 feet); in November-December at depths of 50 to 60 meters (164-197 feet) in accordance with seasonal distribution of sprat in water layers.

Conical nets are operated from both sides of the ship successively: at the time when the starboard net with the lamp on is being lifted to the dock, the port net is being lowered into water and its lamp is turned on as soon as the starboard net has been lifted. These successive operations allow time not to be wasted on attracting fish into the lighted space, for the fish concentrated around the source of light move to the side of the fishing boat from which the conical net with an electric lamp is suspended. The time during which the conical net is kept at a desired depth depends on the concentration of the fish (sprat). On heavy concentrations (catch varying from 50 to 100 kg. (110-220 pounds) per haul, the net is kept in the water for 2 or 3 minutes, the time being reduced to 1 minute when the catch per haul exceeds 100 kg. (220 pounds). When the catch per haul is small (from 10 to 25 kg. or 22 to 55 pounds) the net is kept in the water for 3 to 6 minutes. The setting and lifting of the conical net are accomplished only with the ship's winch via a pulley fixed at the tip of the boom. The lifting speed is of great significance as it affects the catch. Experience showed that the lifting of the conical net should be done at the speed of 0.45 m./sec.

Conical net fishing with light is usually done when the ship is at anchor because with the ship drifting the concentrations of fish in the underwater lighted area begin to thin out.

Strong currents, swell of the sea, or sharp winds cause a decline in catches with conical nets, the the more so if fishing is not done at great depths.

Fishing in the Caspian Sea proves the effectiveness of conical-net fishing with light. Two types of sprat are the object of fishing there: anchovy-type sprat (Clupeonella engrauliformis) and common sprat (C. delicatula caspia). Following our investigations in the Caspian Sea in 1948, commercial fishing for sprat with light started and was later on improved and developed.

At present Caspian sprat are fished in winter as well as in summer and not only on the eastern coasts of the Central and South Caspian Sea but on the western coasts too--in the waters of Daghestan and Azerbaidzhan.

A conical net requires an exceedingly small amount of netting--about 3 kg. (7 pounds) per net.

The Caspian fishermen's successes became widely known among the fishermen of other commercial basins of the U.S.S.R. The Black Sea fishermen after going to the Caspian Sea to see the new method in operation started successfully using it at home. ...

N. N. Danilevsky carried out experiments in the Black Sea on fishing with a pelagic trawl with the help of flickering electric light. Underwater lamps of 500 to 1,000 watts were tied to a rope running from the lead line to the other board. In the course of trawling the light was successively turned on for 3-5 seconds and then switched off for 12-15 seconds.

"On thinly concentrated schools the catch amounted to 700 pounds for a 20-minute haul, while on dense schools the anchovy were so abundant that the catch broke the belly of the trawl"--N. N. Danilevsky writes in Rybnoe Khozjaistvo (No. 2, 1952). Apart from anchovy, a certain number of sprat (Sprattus) and horse mackerel (Trachurus) were captured. However the experiments were not repeated.

In August-September of 1948 the first experiments with electrical light fishing were conducted by our research group in the Far East seas. The experiments showed that the fishes attracted by the above-water light at night include saury (Cololabis sajra), small smelt (Hypomesus), Japanese dace (Leuciscus brandti) and Atka fish (Pleurogrammus azonus).

Fishing was done with a pyramidal net of our own design, the only difference between it and the conical net being the shape of the entrance to the net--square instead of round. Investigations were conducted in South Primorje (Precbrazhenje Bay) as well as on the western and eastern coasts of South Sakhalin.

I Piskounov (Rybnoe Khozjaistvo, No. 7, 1949) and G. Grishchenko Proceedings of the Pacific Institute of Marine Fisheries, v. 34, 1951) point out that the Far East herring are also attracted by electric light, but only during the periods before and after spawning (in the early period of after-spawning feeding).

In the summer of 1956 extensive experimental work on saury fishing with the help of above-water electric light was carried out in the Pacific Ocean in the area between the Hokkaido latitude and the latitude of Fritz Strait. The fishing was done with lift nets of Japanese design and conical nets of our own design with the help of above-water electric light. Thirty blue 0.5 kw. electric lamps were used to attract saury to the side of the fishing boat and five red 0.5 kw. lamps--to make saury concentrate in a small surface area. Both blue and red lamps were used in sets (chandeliers).

A quadrangle of 23 to 20 meters of netting was lowered from the starboard on a bamboo pole, the lifting being done with the help of 5 ropes or wires attached to the lead line of the net. A set of red lamps was fixed above the lift net. The blue lamps on the left side of the boat remained turned on for the fish to concentrate in the lighted area. Then the port lights were turned off and the starboard red lights above the net were turned on. The saury swarming under the port lights were attracted by the red lights, immediately swam toward them underneath the boat, and became trapped in the net which was quickly lifted. The catch per haul ranged from 300 to 2,000 pounds. The conical net catches with the help of above-water light ranged from 40-60 kg. (88-132 pounds) to 200-300 pounds per haul.

The Japanese get record saury catches with the help of electric light. In 1954 their total saury electric light catch amounted to 290 million pounds.

The use of the fish pump opens up new perspectives in the field of electric light fishing. In the U.S.S.R. this idea belongs to N. S. Forshtut, an engineer, who first recorded it in 1948 after the end of the earliest period of our investigations with electric light in the Caspian Sea. He was the first to carry out experiments on Caspian sprat fishing with a fish pump. A corrugated pump intake hose was lowered into the water in depths from 11 to 24 meters (35-79 feet). A powerful electric lamp in a wire-net funnel was attached to the intake of the hose. The catches were small and many fish were greatly bruised due to imperfections in the pump used.

Pump fishing was later on improved and developed by A. F. Leksoutkin, A. F. Shishkov, and A. H. Pateev under the guidance of I. V. Nikonorov. The RB-150 fish pump used by them is installed on the deck of the fishing boat and operated by an electric motor. The hose is 100 meters (328 feet) long in order to be able to fish at greater depths. One or two 1,500-watt electric lamps are fastened at the intake of the hose.

The fish (sprat) enter the lighted area and are pumped up the hose alongside with water into a receiving tank which separates the fish from the water. Caspian sprat catches per night of fishing by one of the fishing boats, the "Toros," ranged from 700 to 16,000 pounds in December of 1954 and from 500 to 15,000 pounds in January 1955. The total catch in December 1954 amounted to 95,000 pounds and in January 1955--104,000 pounds.

Pump fishing with electric light has a number of advantages as compared to conical net fishing: it is continuous, labor-saving, and requires no netting. Thus pump fishing with electric light on a commercial basis makes the problem of netless fishing quite a realistic one.

Everything said above applies to those species of fish which are attracted at night by electric light. About 20 species are known to be attracted by electric light in the U.S.S.R. seas; however as yet only two of them--anchovy-type and common sprats (kilka) of the Caspian Sea--are the objects of commercial fishing. Work is going on to develop commercial fishing for the Black Sea horse mackerel and anchovy (Khamsa). Commercial fishing for saury and Atka mackerel in the Far East seas has not yet been started. The question of the possibility of electric light fishing for the Pacific and North Atlantic herrings on a commercial scale has not yet been settled.

Apart from the fishes attracted by the electric light at night, there are some species which are frightened away by light and try to leave the zone of above-water or underwater light. To these species belong: lamprey (Lamperta fluviatilis), eel (Anguilla anguilla), and mullet (Mugil).

Our investigations in the Caspian and Baltic Seas showed us the way to take advantage of this peculiarity of the fish. In 1951 N. I. Sementchenko started fishing for Caspian mullet with a trammel net using the searchlight to frighten the fish away in the direction of the net. The mullet finding themselves in the brilliantly lighted space try to leave it and, being surrounded by the trammel net, are entrapped in it. Using this method N. I. Sementchenko's crew captured 47,400 pounds of mullet in 1952 and 68,500 pounds in 1953.

It should be noted that with the help of the searchlight installed at the bow of the ship we scouted not only for mullet but for other pelagic fishes with negative reaction to electric light.

V. A. Abakoumow carried out experiments on fishing for lamprey (Lampetra fluviatilis) in the Gauja River (Gulf of Riga of the Baltic Sea). In the autumn of 1954 he fished on the runs of lamprey with fyke nets by lighting the bank parts of the river and leaving the middle part in darkness. "The total catch per hour by one fyke net with the help of electric light was twice as big as that by five control fyke nets set in a weir," V. A. Abaloumov writes in Rybnoe Khozjaistvo (No. 1, 1956)....

The efficiency of artificial light depends on a number of conditions: transparency of water, moon phase, intensity, intensity of light, species of fish, physiological condition of fish, their age, etc.

In the water basins with a small degree of water transparency (as the Azov Sea), the efficiency of the attraction of fish by light is sharply reduced. Moonlight and especially the light of the full moon in a cloudless sky also reduces the efficiency of attraction to a great extent.

The optimum efficiency of artificial light is different for different species, e.g. light optimum is higher for anchovy, pilchard, and mackerel than for horse mackerel.

Many species do not approach a powerful source of light closely but keep at some distance from it. This distance increases with the increase in the intensity of light and vice versa.

A more thorough investigation into the behavior of fish under the influence of electric light, electrical current, and sound is one of the main tasks before our fishery research insitutes.

The development of and improvements in physical methods of influencing the fish will completely solve the problem of netless fishing.

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NEW FACTORYSHIP OPERATIONS DESCRIBED: The official Russian fishery paper Rybnoje Chosatswo published a detailed account of the first practical experiences with the factory trawlers built some time ago in Germany, according to a report in Fiskets Gang (August 23, 1956), a Norwegian fishery periodical. Maximum production per factory vessel is stated as 600 metric tons at the greatest action radius of 3,000-3,500 nautical miles without taking on new supplies. This is the equivalent of 60 to 70 days at sea. All the deck machinery is driven electrically. There are two 2-ton cargo booms and winches forward and two 5-tons winches aft, an anchor winch for two anchors, and a trawl winch driven by a 130-hp. electric motor with a towing power of 9 tons.

For fish processing there is a fully mechanized installation and a fillet plant with partial manual operation. Fish which are 50 cm. (about 20 inches) long and over are handled in the fully-mechanized plant. This includes a beheading machine driven by a $1\frac{1}{2}$ hp. motor with a capacity of 22 to 24 fish a minute. The manual operation consists of three belt conveyors, a skinning machine, and a beheading machine for fish under about 20 inches with a capacity of 40 fish a minute. The cold-storage space on the port and starboard sides can store about 300 metric tons from the daily fillet production of 7 to $7\frac{1}{2}$ tons. Fish blocks are glazed and packed in cartons holding 9 blocks. Each block weighs about 3.5 kilograms (7.7 lbs.). The cartons measure 80 x 7.5 x 7 cm. (about 31.5 x 3.0 x 2.8 inches). Freezing the fillets and bringing their temperature to about -18° C. (0° F.) takes $3\frac{1}{2}$ to 4 hours.

The processing waste is collected in a tank (which holds three tons) from which it is conveyed to 2 vacuum dryers. The vacuum-dried material is then pressed in a press which is hydraulically operated. The fish-meal installation can handle 23

tons a day. The yield for the waste is about 22-percent fish meal with a water content of about 10 percent. The drying process requires about 4.5 hours in both dryers. The oil yield is about one percent. To dry one kilogram (2.2 lbs.) of waste requires about 2 kilograms (4.4 lbs.) of steam. Two liver-oil boilers, each of which holds 350 kilos (771 lbs.) of fish livers can be emptied about hourly and give a liver-oil yield of about 35 percent.

The experiences with the first two German-built trawlers of this class--Pusjkin and Gogol--in the summer of 1955 gave the results per trip shown in the table.

	Pusjkin	Gogol
Length of trip, days	63	65.5
At sea, days	49.1	54.5
On grounds, days	46.0	51.7
Gross catch, metric tons	1,088	1,227
Net catch, metric tons	636	712
Trawling hours a day	10.7	11.4
Gross catch a day, metric tons	11.8	11.9
Gross catch a trawling hour, pounds	2,400	2,300

While the Pusjkin required 1 hr. 45 min. to set and take in its stern trawl, the Gogol recorded times of only 38 minutes. Since experience should speed up the trawling operation it is hoped in the near future to attain a daily catch of 50 gross tons.

The procedures which had been developed for handling the trawl have been shown to be substantially correct. Taking the trawl in over the stern on the upper deck permits close examination and the discovery of defective portions after each haul; also, it is possible to make minor repairs at once. Since processing of the catch is done on another deck, it can take place independently of the trawling, which is not the case for other types of trawlers. It was stated that the crew did not, at all times, have adequate knowledge of the new vessels, and also certain unsatisfactory conditions had to be overcome. For example, the types of trawls were the same as used on the regular vessels, but the engines on the new vessels had double the power of the regular vessels. Larger and stronger gear must be used and a simplification of the arrangement on the stern for taking up the catch.

The fear that the hauling up of the trawl would be difficult and that in a strong sea there would be a continual danger of tearing the trawl has been shown to be unfounded. On the contrary, in heavy weather when the older-type trawlers had to cease fishing, the new vessels continue to fish. It is desirable to build larger trawlers of this type with the intention of expanding the factory installations to handle small fish (haddock) for canning, etc. At present these fish are utilized by the fish-meal plant.

With respect to the operating areas of the new large trawlers, it was stated that Russian research vessels had worked on the Newfoundland banks, and that when the catches were low in the Barents Sea, which is the normal operating area for trawlers from Murmansk, there were the following alternatives: Bear Island from November to February and from April to July; in the area West of Spitsbergen from August to October; off the Norwegian Coast from January to May; off Iceland from May to July; off West Greenland from July to February; and on the Newfoundland banks from February to July. The assumption was that the operations of the trawler fleets fishing these areas would be significantly improved, especially the new trawlers. More important, the fish in these latter areas, on the average, were much larger than those in the Barents Sea. It seems that Russian fishery circles are breaking away from the earlier "conventional" trawlers in the area around Murmansk to take part, to a greater degree, in the fisheries in international waters.

United Kingdom

BRITISH-ICELANDIC FISHERIES DISPUTE SETTLED: The settlement of the Anglo-Icelandic Fisheries Dispute, negotiated by the industries of both countries, and agreed to in April 1956, was signed in Paris on November 14, by the President of the British Trawlers' Federation and by the President of the Icelandic Trawler Owners' Union. The agreement was reached under the auspices of the Office of European Economic Cooperation, states The Fishing News of November 23, 1956.

The agreement provides for three main points: regulated landings of Icelandic-caught fish; a standstill on Iceland's present four-mile point-to-point territorial waters limit; and the appointment of a special conciliation group to deal with matters under dispute. The Icelanders have also agreed to allow British trawlers to run for shelter inside their fishing limits without stowing their gear.

The agreement, which will last for ten years and subject to reviews after two years, limits imports of Icelandic-caught fresh fish on ice to an annual total of £1,800,000 (US$5,040,000). This total is separated into four quarterly periods: January-March, April-June, July-September, October-December. Fish to the first hand value of £450,000 (US$1,260,000) can be imported during each of these periods.

Within any single month the imports shall not exceed two-fifths of the allowed value of the quarter. In an effort to avoid market gluts, expecially of single varieties, in no month or quarter shall the total value of haddock and flat fish exceed 40 percent of the total. Also during the same period the total value of cod and all other varieties shall not exceed 60 percent of the total.

Iceland has agreed to take no further action on the question of territorial limits while the whole Law of the High Seas is being discussed at the present General Assembly of the United Nations. The British Government, noting the Icelanders' declaration, states that this does not imply Britain's recognition of the validity of the present Icelandic limits.

The agreement gives Iceland the opportunity of resuming fish landings in Britain at a slightly higher rate than existed in the years before the dispute. The total amount of £1,800,000, means that Iceland can now supply about 8 percent of the total fish landed by British distant-water vessels. In the years prior to 1952, when the dispute began, Icelandic vessels landed 6.3 percent of the total.

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FIRST DIESEL-ELECTRIC TRAWLER "PORTIA" IS HULL'S FASTEST SHIP: The new British Diesel-electric trawler Portia during speed trials over a measured mile averaged a speed of 15.8 knots in very heavy weather. The vessel cost £250,000 (US$700,000), states the November 1956 issue of The Fishing News. This was almost

two knots more than the average attained by the latest steam trawler under calm conditions and makes her the fastest vessel in the Hull fishing fleet.

When fishing the distant grounds the vessel will be able to save 15 hours on the homeward trip from Iceland and cut the sailing time from Bear Island by 19 hours.

After her acceptance trials on the Tees, the Portia left Middlesbrough for Hull. En route the vessel tested her trawling gear and caught 1,400 pounds of fish including 700 pounds of haddock. Offered at the wholesale market in Hull, this North Sea fish realized US$473 ex-vessel.

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NEW TIDE INDICATOR DEVELOPED: A new eight-inch tide indicator, designed to show the actual state of the tide at any particular hour and to be used in any port, has been invented by a British Central Electricity Authority engineer at East Yelland.

The great advantage of this new indicator is its size--it resembles a slide rule. By simple calculation the tide state can be worked out in a matter of seconds.

The indicator also gives the depth of water at dock gates and cuts down the use of nautical almanacs.

The device is undergoing certain corrections before being rigorously tested and submitted to the National Physical Laboratory of the Liverpool Observatory and Tidal Institute for their opinion (The Fishing News, September 21).

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NEW WAGE AGREEMENT REACHED AT GRIMSBY FOR FISH PROCESSING WORKERS: The Grimsby Fish Merchants' Association and fish processing workers unions reached an agreement on wages and other conditions late in October 1956. The new rates were effective with the week beginning October 29, according to The Fishing News of November 2, 1956.

Under the agreement male splitters and filleters will now receive a minimum of 180s. (US$25.20) a week at 20 years of age; at the age of 15, 60s. ($8.40), rising by annual increments to 150s. ($21.00) at age 20. Female splitters and filleters will receive 110s. ($15.40) weekly at the age of 20 and other age classes will rise from 51s. ($14.21) at the age of 20. All rates are based on a $5\frac{1}{2}$-day 45-hour week.

Where incentive or bonus rates are in operation, lower rates may be paid provided the guaranteed minimum earnings for a 45-hour week are not less than those provided in the agreement. Overtime and holiday pay are calculated at a rate not less than the appropriate minimum rates.

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1957 INTERNATIONAL FISHERIES EXHIBITION AT LOWESTOFT: The International Fisheries Exhibition to be held at Lowestoft from October 21-26, 1957, will be the first of its kind in Great Britain. Representation has already been promised from firms in several overseas countries. Lowestoft is a progressive fishing port with excellent facilities for an exhibition, both on land and on water, points out a November 20, 1956, dispatch from the United States Embassy in London.

The Exhibition will cover all aspects of the commercial fishing industry--shipbuilding, engines, catching, processing, packaging and distribution, and all the equipment necessary for those operations. It has been granted the backing of both the White Fish Authority and the Herring Industry Board.

The Exhibition will be staged in two halls. The Pavilion will show sea-going equipment (shipbuilding, engines, navigational instruments, nets and ropes, life-saving equipment, etc.), and at the Palais will be products normally used on land (processing machinery, freezers, refrigeration, boxes, transports, foods, etc.). In addition to the two halls, the organizers have been granted the use of the Yacht Basin which adjoins the Pavilion. Modern trawlers and other fishing craft will be open for inspection, and the basin will also be made available for those firms with suitable vessels or products for demonstration.

HALIBUT ONE-DISH MEAL

Halibut is the largest of the flatfishes and is found in the cold waters of the North Pacific, the Arctic, and the North Atlantic oceans. Commercially, halibut range in size from 5 to more than 80 pounds, but a few as large as 400 pounds have been reported.

Even though the greatest proportion of halibut comes from the Pacific Northwest, halibut is available in all parts of the United States, mainly as frozen steaks. Steaks are the cross-section slices of dressed fish, each containing a short section of the backbone. Chunks and fillets are other forms in which halibut may be purchased.

Halibut is one of the most highly prized of all white-meated fish. This firm and flavorful fish is appreciated by all who are familiar with it. Halibut may be prepared by any of the basic cooking methods such as frying, baking, broiling, boiling, and steaming.

For your dinner menu, the home economists of the United States Fish and Wildlife Service are suggesting a one-dish meal, "Curried Halibut Casserole" which features boiled halibut in combination with noodles, asparagus, and cheese and flavored with curry.

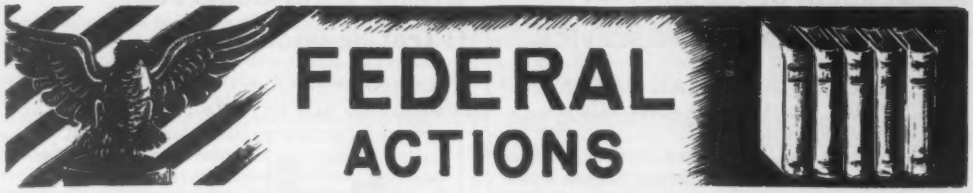
Other attractive and nutritious recipes are contained in the recipe booklet How to Cook Halibut, Test Kitches Series No. 9, which is available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at a cost of 20 cents a copy.

CURRIED HALIBUT CASSEROLE

- 1 POUND HALIBUT STEAKS OR FILLETS, FRESH OR FROZEN
- 1 QUART BOILING WATER
- 1 TABLESPOON SALT
- 1 PACKAGE (8 OUNCES) NOODLES
- 1½ TEASPOONS CURRY POWDER
- 2 TABLESPOONS BUTTER OR OTHER FAT, MELTED
- ½ CUP MILK
- 1 CAN (10 OUNCES) CREAM OF MUSHROOM SOUP
- 1 CAN (1 POUND 4 OUNCES) ASPARAGUS, DRAINED
- 1½ CUP GRATED CHEESE

Place steaks in boiling salted water. Cover and return to boiling point; simmer for 10 minutes or until fish flakes easily when tested with a fork. Drain, remove skin and bones. Flake.

Cook noodles as directed on package; drain. Place in a well-greased 2½-quart casserole. Cover with fish. Combine curry powder, butter, milk, and soup. Pour over fish and noodles. Arrange asparagus over casserole and sprinkle with cheese. Bake in a moderate oven, 350° F., for 25 to 30 minutes or until brown. Serves six.



Federal Trade Commission

ORDER ISSUED AGAINST PRICE FIXING ON KING CRABS IN ALASKA:

The Federal Trade Commission on December 31, 1956, adopted the finding of a Commission hearing examiner that United Fishermen of Alaska, a Kodiak, Alaska, affiliate of the Seafarers International Union of North America (American Federation of Labor), has engaged in conspiracy and coercion to fix the prices of raw king crabs.

The Commission made final the examiner's order (Docket No. 6368, King Crabs) prohibiting the Union and an association of boat owners or captains from doing the following things:

> Fixing or attempting to fix any price at which king crab or crab meat is to be purchased or sold;
>
> Jointly or collectively negotiating as to any such price;
>
> Coercing or compelling purchasers or sellers of king crab or crab meat to adhere to any price;
>
> Preventing or attempting to prevent any person from accepting or retaining employment in a cannery or other establishment processing king crab, with the purpose or effect of causing the establishment to maintain any particular price.

The order, however, is not construed as preventing the following things:

> Any respondent, individually, from negotiating with any canner or processor;
>
> Any association of bona fide fishermen from acting in accordance with the Fishermen's Cooperative Marketing Act;
>
> Collective bargaining between the Union and any employer with respect to wages, hours, and working conditions of Union members.

The opinion of the examiner as adopted by the Commission held that since 1952 the Union, the boat owners' association, and three canners in the area have conspired to fix prices paid by these canners for live king crabs. In addition, the opinion stated, the Union and Association have used coercive methods against a fourth canner, who refused to pay these prices.

Two of the three canners named in the complaint, issued June 27, 1955, agreed to accept a consent order, which was approved by the Commission May 3. The third company was in default, and the examiner issued an order against it. The Commission affirmed this order on December 31.

According to the examiner, since 1952 negotiations among the parties have resulted in a fixed price paid for crabs. In 1954 and 1955 this price was $9\frac{1}{2}$ cents a pound.

When one Alaska fisheries firm refused to pay more than 8 cents a pound, the examiner said, its officials were told, among other things, that it would not be allowed to operate, that it would get no crabs, and that it would get into difficulties and have trouble with its gear.

This was "in no sense a 'labor dispute' involving wages, hours, working conditions, etc.," the examiner said. Rather, he continued, here were attempts "to maintain and enforce (an illegal) combination through coercion."

The cease and desist order was published in the January 12, 1957, issue of the Federal Register.

Note: Also see Commercial Fisheries Review, October 1956, p. 103.

Department of the Interior

U. S. FISH AND WILDLIFE SERVICE

NO CHANGE IN REGIONAL PATTERN FOR SPORT FISHERIES AND WILDLIFE ADMINISTRATION:

No change will be made in the present regional pattern for the United States Fish and Wildlife Service sport fisheries and wildlife administration, it was announced January 14 by Ross L. Leffler, new Assistant Secretary for Fish and Wildlife of the Department of the Interior, at the first session of the annual winter meeting of the Service's regional directors.

There are presently five regions with headquarters at Atlanta, Ga.; Boston, Mass.; Minneapolis, Minn.; Albuquerque, New Mex.; and Portland, Ore.; in addition to an Alaskan administrative area.

A proposal for the future creation of four regions within the United States following the pattern of the four flyways for migratory waterfowl, which are the administrative responsibility of the Federal Government, was made in the first draft of the Fish and Wildlife Service reorganization plan which was revealed in November 1956.

This planning was set in motion by Public Law 1024 of the 84th Congress last summer. It was pointed out by Secretary of the Interior Fred A. Seaton at the time copies of the first plan were distributed to the staff and various national conservation organizations for study that it was not final. He said it was subject to review of Interior's new Fish and Wildlife officials as soon as appointed, and would be revised wherever necessary. A complete re-examination of the plan began immediately after Assistant Secretary Leffler's appointment, and his announcement followed.

Eighty-Fifth Congress (First Session)

Listed below are the public bills and resolutions and reports that directly or indirectly affect the fisheries and allied industries. Public bills and resolutions are shown when introduced; from month to month the more pertinent reports and hearings, or chamber actions on the bills shown are published; and if passed, the date when signed by the President.

OPENING OF THE FIRST SESSION: The first session of the 85th Congress convened on January 3, 1957.

ALASKA FISHERIES TRANSFER (ALASKA ORGANIC ACT): H. R. 2133 (Bartlett) introduced in the House on January 7, a bill to amend the Organic Act of Alaska and other purposes; to the Committee on Interior and Insular Affairs. Would amend the Alaska Legislative Assembly Act to transfer control of the fisheries and game resources from the Department of the Interior to Alaska, but excepts fur-seal or sea-otter fisheries and supervision or control of the Pribilof Islands; which shall remain under control of the Department of the Interior as heretofore.

ALASKA SALMON TRAP ELIMINATION: H. R. 3015 (Bartlett) introduced in the House January 16, a bill to provide for the gradual elimination of salmon traps in the waters of Alaska; to the Committee on Merchant Marine and Fisheries.

Also: introduced in the House January 28: H. R. 3761 (Dingell)--Similar to H. R. 3015.

ALASKA STATEHOOD: H. R. 340 (Mack of Illinois) introduced in the House January 3, a bill to enable the people of Alaska to form a constitution and State government and to be admitted to the Union on an equal footing with the original States; to the Committee on Interior and Insular Affairs.

Also: introduced January 3: H. R. 1242 (Saylor), H. R. 1243 (Saylor) for Hawaii and Alaska, S. 49 (Murray and 24 other senator--are similar to H. R. 340 and referred to the respective House and Senate Committee on Interior and Insular Affairs.

AID TO BUSINESS AND OTHERS INJURED BY TARIFF REDUCTIONS: H. R. 457 (Smith of Mississippi) introduced in the House January 3, a bill to provide Federal assistance to business enterprises, communities, and individuals injured by tariff reductions; to the Commitee on Ways and Means. This bill, called the "Federal Tariff Reduction Adjustment Act," sets up a Trade Adjustment Board unaffiliated with any agency or department of the Federal Government. The Board shall receive and consider any application for adjustment assistance under this Act which is filed by a business enterprise, or by the community in which such enterprise is located, or

by the employees of such enterprise, alleging that the applicant is being injured or threatened with injury as a result of tariff reductions by the United States. Adjustment assistance will be provided by grants-in-aid to States and will include funds for (1) retraining of employees; (2) loans to assist in the rehabilitation of communities which have been injured by tariff reductions; (3) loans to communities for development of new employment opportunities; (4) extension of 90 days during which unemployment insurance may be paid to employees displaced from their employment by reason of tariff reductions. In addition the bill provides for loans to business enterprises injured by tariff reductions for diversifying production, modernizing plant and production facilities, and moving to more favorable producing areas. Also accelerated amortization of certain facilities.

CHEMICAL ADDITIVES IN FOOD: H. R. 4432 (Sullivan) introduced in the House February 5, a bill to protect the public health by amending the Federal Food, Drug, and Cosmetic Act so as to provide for the safety of chemical additives in food; to the Committee on Interstate and Foreign Commerce. Provides that no person shall introduce or deliver for introduction any chemical additive, unless the use of such chemical additive has been approved by the Secretary of Health, Education, and Welfare. Sets up an Advisory Committee for determining whether or not "chemical additives" are harmful to the consuming public when deemed advisable by the Secretary or upon notification from the applicant. The advisory Committee will report, after independent study of the proposal, to the Secretary. If the Secretary and his advisory Committee have refused to approve the application, the applicant may file objections thereto and request a public hearing.

DEPLETION ALLOWANCE FOR TRANSPORTATION OF MOLLUSK SHELLS: H. R. 484 (Thompson of Louisiana) introduced in the House January 3, a bill to provide that the transportation of mollusk shells (including clams and oyster shells) from the point of extraction to the dockside shall be taken into account in computing percentage depletion; to the Committee on Ways and Means.

Also: introduced in the House January 3: H. R. 1067 (Boggs); January 5: H. R. 2034 (Thompson of Texas)--similar to H. R. 484.

DISTRICT OF COLUMBIA FISH AND GAME LAWS: S. 532 S. 532 (Beall) introduced in the Senate January 10, a bill to revise and modernize the fish and game laws of the District of Columbia, and for other purposes; to the Committee on the District of Columbia.

Also: introduced January 10: H. R. 2454 (Hyde)-- similar to S. 532.

DUMPING PROHIBITED IN COASTAL WATERS: H. R. 5046 (Dorn) introduced in the House on February 19, a bill to aid naviagation and protect the fishing industry in the waters adjacent to New York City by prohibiting the dumping of certain materials in said waters; to the Committee on Public Works.

EQUAL PAY FOR WOMEN: S. 817 (Smith of New Jersey and others) introduced in the Senate January 25, a bill to prohibit discrimination on account of sex in the payment of wages in commerce or in the production of goods for commerce, and to provide procedures for assisting employees in collecting wages lost by any such discrimination; to the Committee on Labor and Public Welfare.

Also: introduced in the House January 3: H. R. 651 (Green of Oregon), H. R. 715 (Kelly), H. R. 840 (Multer); February 6: H. R. 449 (Addonzio); February 14: H. R. 4825 (Roosevelt)--are similar to H. R. 715.

FAIR LABOR STANDARDS ACT INCREASED COVERAGE: H. R. 4697 (Roosevelt), introduced in the House on February 11, a bill to amend the Fair Labor Standards Act of 1938, as amended, to provide coverage for employees of employers who are engaged in activities affecting interstate commerce, to eliminate certain exemptions, and for other purposes; to the Committee on Education and Labor. Continues the exemption for any employee employed in catching, taking, harvesting, cultivationg, or farming of any kind of fish, shellfish, crustacea, sponges, seaweeds, or other forms of animal or vegetable life.

Also: introduced in the House February 11: H. R. 4708 (Thompson of New Jersey); February 14: H. R. 4844 (Wier). Introduced in the Senate February 18: S. 1267 (Morse, Murray, Needy, and McNamara); February 19: S. 1273 (McNamara, Murray, and Morse). Introduced in the House February 19: H. R. 5018 (Holland); February 20: H. R. 5119 (Forand)--All similar to H. R. 4697, but wording varies in some bills; all House bills referred to the Committee on Education and Labor and Senate bills to the Committee on Labor and Public Welfare.

FISH AND WILDLIFE SERVICE POSITIONS: H. R. 3650 (Reuss) introduced in the House January 24, a bill relating to positions in the United States Fish and Wildlife Service; to the Committee on Merchant Marine and Fisheries. Provides for restoring the competitive merit system to the Fish and Wildlife Service by limiting the number of appointments under Schedule C, or noncompetitive positions, to the Assistant Secretary of Interior for Fish and Wildlife and the Commissioner of Fish and Wildlife.

NATIONAL POLICY: H. R. 612 (Donohue) introduced in the House January 3; a bill to establish a sound and comprehensive national policy with respect to fisheries; to create and prescribe the functions of the United States Fish Commission; to strengthen the fisheries segment of the national economy; and for other purposes; to the Committee on Merchant Marine and Fisheries. Similar to numerous bills introduced in the 84th Congress (Second Session). See Commercial Fisheries Review, January 1956, p. 64.

FISHING FLEET MAINTENANCE: H. R. 3059 (King) introduced in the House January 16, a bill to amend Title V of the Merchant Marine Act of 1936, as amended, to promote the maintenance of the American fishing fleet under competitive conditions and in the interest of sustained fish food supplies in case of emergency and for other purposes; to the Committee on Merchant Marine and Fisheries. A new section to Title V of the act provides that:

"Sec. 512. (a) Any qualified fisherman who is a citizen of the United States, or any corporation of the United States engaged in fishing, may make application to the Federal Maritime Board for construction-differential subsidy to aid in the construction of a new fishing vessel or vessels.

"(b) No such application shall be approved by the Board until it determines (1) that the applicant will aid in the development of the fishery trade and will declare his or its readiness, respectively, to use the vessel or vessels for either intensified fish food supplies or for military or naval purposes in time of war or national emergency, (2) that the applicant possesses the ability, experience and other qualifi-

cations necessary to enable it to operate and maintain the proposed new vessel or vessels, and (3) that the granting of the aid applied for is reasonably calculated to replace worn out or obsolete tonnage with a new or modern vessel or vessels.

"(c) No subsidy shall be awarded pursuant to this section if the applicant does not show sufficiently that the fish or fishery products he or it is producing or intends to produce suffer from foreign competition and that the subsidy is needed to keep the American fishing fleet in such status of efficiency as is necessary to meet the foreign competition.

"(d) The Board shall adopt appropriate rules and prescribe for the administration of the provisions of this section."

FISH HATCHERIES: H. R. 662 (Gavin) introduced January 3; a bill to provide for the establishment of a fish hatchery in the Northwestern part of Pennsylvania.

H. R. 3647 (Reuss) introduced in the House January 24, a bill to provide for the establishment of a fish hatchery in the State of Wisconsin.

H. R. 3970 (Dingell) introduced in the House January 29, a bill to provide for the establishment of a fish hatchery in the State of Michigan.

Also: H. R. 4268 (Dingell) introduced in the House February 4 similar to H. R. 3970. All the above referred to the Committee on Merchant Marine and Fisheries.

HAWAII STATEHOOD: H. R. 339 (Mack of Illinois), a bill to enable the people of Hawaii to form a constitution and State government and to be admitted to the Union on an equal footing with the original States; to the Committee on Interior and Insular Affairs.

Also: introduced in the House January 3: H. R. 628 (Engle); H. R. 848 (O'Brien of New York); H. R. 1243 (Saylor); Hawaii and Alaska: H. R. 1246 (Saylor); Introduced in the Senate January 7: S. 50 (Murray); All referred to the Senate Committee on Interior and Insular Affairs. All similar to H. R. 339.

IMPORT QUOTAS: H. R. 300 (Lane), introduced in the House January 3, a bill to regulate the foreign commerce of the United States by establishing import quotas under specified conditions, and for other purposes; to the Committee on Ways and Means. Authorizes the adjustment of duty rates on imports, the establishment of import quotas, to stabilize imports under conditions of fair competition, and to establish the basis for an expanding foreign trade of the United without creating hardship for domestic industry, agriculture, and labor. The industries producing articles or merchandise for shipment to the United States from other countries, under this Act, will be classified with respect to wage payments in seven groups ranging between 15 and 75 percent or more of the domestic rate.

Also: introduced in the House January 10: H. R. 2566 (Patterson); January 14: H. R. 2776 (Bailey), H. R. 2821 (Mason), H. R. 2836 (Seeley-Brown); January 17: H. R. 3214 (Davis of Georgia); February 11: H. R. 4670 (Tollefson)--all similar to H. R. 300.

IMPORTED FOOD PRODUCTS STANDARDS: H. R. 530 (Andresen) introduced in the House January 3, a bill to provide for standards to be prescribed by the Secretary of Agriculture governing imported agricultural products; to the Committee on Agriculture. Provides that United States regulations which prescribe standards or requirements for the labeling, packaging, quality, sanitation, or standards of identity, in respect to the production, manufacture, processing, packaging, distribution, or handling of any product of plant or animal life used or intended to be used as food for human and animal consumption in the United States, the Secretary of Agriculture shall prescribe like standards and requirements for similar products imported into the United States from foreign countries.

Also: introduced in the House January 3: H. R. 1080 (Byrnes, similar to H. R. 530.

INCOME TAX LAW REVISION IN FAVOR OF FISHERMEN: H. R. 3061 (King) introduced in the House January 16, a bill to extend to fishermen the same treatment accorded to farmers in relation to estimated income tax; to the Committee on Ways and Means.

Also: introduced in the House February 6: H. R. 4521 (Kelly)--Similar to H. R. 3061.

INSECTICIDES, STUDY OF EFFECT UPON FISH AND WILDLIFE: H. R. 783 (Metcalf) introduced in the House on January 3; a bill to authorize and direct the Secretary of the Interior to undertake continuing studies of effects of insecticides, herbicides, and fungicides upon fish and wildlife for the purpose of preventing losses of those invaluable natural resources following spraying, and to provide basic data on the various chemical controls so that forests, crops, and marshes can be sprayed with minimum losses of fish and wildlife; to the Committee on Merchant Marine and Fisheries.

LOAN INCREASE FOR SMALL BUSINESS: S. 637 (Clark) introduced in the Senate January 3, a bill to amend the Small Business Act of 1953 to increase the amount available thereunder for business loans; to the Senate Committee on Banking and Currency.

Reported favorably without amendment (Report No. 12) on January 25. Passed by the Senate without amendment on January 29. Provides for increase of $65 million in the amount available for small business.

H. R. 3109 (Spence) similar bill introduced in the House January 3; reported with amendments on January 28 and referred to the Committee of the Whole House of the Union (Report No. 3).

H. R. 3109 (Spence) was passed by the House on January 31 and subsequently vacated in favor of S. 637 (Clark). S. 637 was passed, with amendments, to include the House approved language.

S. 637 (Clark), as amended by the House, was passed by the Senate on February 1 and the bill was cleared for the President. The bill provides for an increase of $80 million in the amount available for small business loans, or from $375 million to $455 million. Th limitation on the amount of small-business loans outstanding at any one time is also increased from $150 million to $230 million.

S. 637 was signed by the President on February 11, 1957 (Public Law 85-4).

LOBSTER INTERSTATE TRANSPORTATION: S. 237 (Payne) introduced in the Senate on January 7; a bill to regulate the interstate transportation of lobsters; and to define the term "lobster" for the purpose of the Federal

Food, Drug, and Cosmetic Act; to the Committee on Interstate and Foreign Commerce. The purpose of this bill is to impose a minimum size on lobsters which may be shipped in interstate commerce or imported into the United States from foreign countries and define the word "lobster" for purposes of the Federal Food and Drug Act. It is designed to assist the states in enforcing their own laws relating to lobster fishing. The justification for regulating the minimum size of lobsters stems from both conservation and economic factors. If there is no state law governing the size of lobsters the bill would establish a minimum size of $3\frac{1}{16}$ inches measured along the center of the body shell (carapace). The measure would also make illegal the importing from a foreign nation of lobsters that would be illegal under the laws of the state into which they are imported, or in the absence of state laws lobsters less than the minimum size established by the bill could not be brought into the state. The bill is patterned after the Black Bass Act which has been in effect for several years and which prohibits the shipment in interstate commerce of fish which are illegal under the laws of the state in which the shipment originates. This bill differs from the Black Bass Act in two significant respects. The first is that this bill is somewhat broader in that in addition to barring shipments in interstate commerce it prohibits imports of lobsters that are illegal under the laws of the state involved or under the terms of this bill if there is no state law. The second difference from the Black Bass Act is that the bill defines the meaning of the word "lobster" for purposes of the Federal Food and Drug Act. Among other things the Federal Food and Drug Act prohibits the shipment in interstate commerce of food that is misbranded. With regard to lobster there has never been any adequate definition of just what species of shellfish were included under the term. As a result many crustaceans that are not really lobsters at all are shipped under the label of lobster. Such products as African rock lobster (an entirely different species than the lobster of the North Atlantic waters of the United States and Canada), crawfish, and many other species are commonly shipped and sold bearing only the label of "lobster." The bill would provide that the word lobster could be used as a label only on the species Homarus americanus, which is the lobster common to the Atlantic coastal waters of the United States northward from Cape Hatteras into Canada.

Also: introduced in the House January 10: H. R. 2445 (Hale), H. R. 2464 (McIntire), January 16: H. R. 3023 (Colfin)--All similar to S. 237, and all referred to the House Committee on Interstate and Foreign Commerce.

MARINE LABORATORY IN FLORIDA: S. 897 (Holland) introduced in the Senate January 29, a bill to provide for the construction of a fish and wildlife marine laboratory and experiment station in the Gulf Coast area of Florida; to the Committee on Interstate and Foreign Commerce.

Also: introduced in the House January 29: H. R. 3998 (Rogers of Florida) February 4: H. R. 4263 (Creamer)--referred to the House Committee on Merchant Marine and Fisheries, and similar to S. 897.

MARKETING FACILITIES IMPROVEMENT ACT: H. R. 4504 (Cooley) introduced in the House on February 6, a bill to encourage the improvement and development of marketing facilities for the wholesale handling of fresh fruits and vegetables, poultry, eggs, dairy products, and other perishable agricultural commodities and sea food as will be conducive to orderly and efficient distribution, increased consumption, and a reduction in the spread between prices paid by consumers and those received by farmers. Loans to States, public agencies, municipalities, public corporations, and private enterprise, or a combination of these, can be made up to 85 percent of the total cost of the market facility. Mortgages outstanding under the Act would be limited to $100 million.

MINIMUM HOURLY WAGE: H. R. 299 (Lane), a bill to amend the Fair Labor Standards Act of 1938 to establish a $1.25 minimum hourly wage, and for other purposes; to the Committee on Education and Labor.

Also: Introduced in the House January 3: H. R. 385 (Rodino), H. R. 556 (Barrett) $1 to $1.50 an hour, H. R. 584 (Celler), $0.75-$1.25 an hour, H. R. 617 (Doyle), H. R. 714 (Kelly), H. R. 839 (Multer), $0.75-$1.25 an hour as prescribed by section 6 (a) (1) of F. L. S. Act of 1930, H. R. 1040 (Zelenka), H. R. 1233 (Rooney); January 5: H. R. 1922 (Rodino); January 10: H. R. 2466 (McCormack) ($0.75 to $1.25 an hour); January 14: H. R. 2881 (Multer); January 16: H. R. 3087 (Santangelo); January 17: H. R. 3219 (Dingell), H. R. 3221 (Dollinger), H. R. 3230 (Green) $1.00-1.50 an hour; January 28: H. R. 3794 (Vanik), H. R. 3846 (McCormack); January 28: H. R. 3988 (Diggs), H. R. 3999 (Roosevelt); February 7: H. R. 4563 (Chycloff), $1.00-$1.35 an hour; February 11: H. R. 4694 (Roosevelt), H. R. 4706 (Shelly), H. R. 4707 (Thompson of New Jersey); February 14: H. R. 4743 (Bennett of Michigan); February 18: H. R. 4899 (Addonzio); February 19: H. R. 5019 (Holland); February 20: H. R. 5118 (Forand)--all similar, except for amount of minimum hourly wage, to H. R. 299.

NATURAL RESOURCES COMMISSION: S. 1019 (Carlson) introduced in the Senate February 1, a bill to establish a Commission on Renewable Natural Resources; referred to the Committee on Interior and Insular Affairs. The Commission would be directed to study the present condition of the renewable natural resources and the probable future demands and to formulate a program for carrying out the declared policy of Congress that "the conservation, orderly development, and sustained use of the renewable natural resources of the United States is the joint responsibility of the Federal Government, the states, the various subdivisions of government and the people thereof..." The Commission should complete its work and submit a final report to the President for transmittal to Congress not later than June 30, 1958.

NORTHWEST ATLANTIC FISHERIES COMMISSION: Protocol to the International Convention for the Northwest Atlantic Fisheries Commission, signed at Washington February 8, 1949, which protocol was signed at Washington June 25, 1956, for the United States and nine other governments (Exec. F, 85th Congress, 1st Session), was received by Senate on February 18th and referred to the Committee on Foreign Relations.

SALMON FISHERIES CONVENTION: Senate on February 11 received Protocol between the United States and Canada to the convention for the protection, preservation, and extension of sockeye salmon fisheries in the Fraser River system, signed at Washington on May 26, 1930, which protocol was signed at Ottawa on December 28, 1956 (Exec. C, 85th Cong., 1st Session); referred to the Committee on Foreign Relations.

SCHOOL LUNCH ACT TO BE EXTENDED: H. R. 3248 (Rhodes), introduced in the House January 17, a bill to amend the National School Lunch Act to permit junior colleges to participate therein; to the Committee on Education and Labor.

SHELLFISH LABORATORY IN CHESAPEAKE BAY AREA: S. 1087 (Butler and Byrd) introduced in the Senate

February 7, a bill to authorize the construction of a shellfish laboratory and experiment station in the Chesapeake Bay area, to the Committee on Interstate and Foreign Commerce.

SHRIMP IMPORT DUTIES: H. R. 475 (Thompson of Louisiana) introduced in the House January 3, a bill to provide for an ad valorem duty on the importation of shrimp; to the Committee on Ways and Means.

The bill provides that paragraph 721 (b) of the Tariff Act of 1930 (U. S. C. title 19, sec. 1001) be amended by inserting after the word "containers" the following: "shrimps, shrimp tails, and shrimp meat, fresh or frozen (whether or not packed in ice), or prepared, canned, or preserved in any manner, 35 per centum ad valorem".

SEC. 2. Paragraph 1761 of said Act (U. S. C., title 19, sec. 1201) be amended by striking out the word "shrimps" so that the paragraph will read:

"Par. 1761. Lobsters and other shellfish, fresh, or frozen (whether or not packed in ice), or prepared or preserved in any manner (including pastes and sauces), and not specially provided for."

Also: introduced in the House January 3: H. R. 1274 (Willis); January 10: H. R. 2415 (Colmer)-- both similar to H. R. 475 (Thompson of Louisiana).

SMALL BUSINESS: House Report No. 2970, Final Report of the Select Committee on Small Business, House of Representatives, Eighty-Fourth Congress, Pursuant to H. Res. 114 (A resolution creating a select committee to conduct a study and investigation of the problems of small business), 199 pp., printed. 84th Congress, 2d Session. Submitted on January 3, 1957, to the Committee of the Whole House on the State of the Union and ordered to be printed. Presents data on the position of small business in the United States economy; increasing prices and the small-business credit squeeze; toward taxation for free enterprise; breakdown of small-business "Magna Carta"; the Small Business Administration loan program; Government subsidies for research and industrial advancement; Government procurement; an appraisal of the Small Business Administration's contribution to small business; work of the committee; and the Committee's recommendations. An appendix contains a number of tables and also minority views.

SMALL BUSINESS CREDIT ACT OF 1957: S. 720 (Sparkman and others) introduced in the Senate on January 3, a bill to make credit more readily available for financing small business by insuring loans made to small business enterprises; to the Committee on Banking and Currency. The bill is designed to foster the development and growth of independent small-business enterprises; to make credit more readily available in adequate amounts on reasonable terms, and to encourage private financial institutions and investors in financing these interprises by insuring loans made to small business. The aggregate principal amount of loans with respect to which insurance may be granted shall not exceed $250,000,000 outstanding at any one time, except that after July 1, 1956, the President may increase this limit to not more than $750,000,000. A premium charge not to exceed 1½ percent a year for the insurance, payable in advance, will be charged on loans which are limited to $250,000 or loans whose maturity is in excess of five years and 32 days. A sum of $10,000,000 will be set up for an initial revolving fund and further sums may be added when needed.

SMALL BUSINESS PROBLEMS STUDY: H. Res. 166 (Thompson of New Jersey), a resolution to authorize the Select Committee on Small Business to investigate and study the problems of small business with respect to basic and applied scientific research and development work; to the Committee on Rules.

TARIFF ACT OF 1930 AMENDMENTS PROPOSED: S. S. 28 (Malone) introduced in the Senate January 7, a bill to amend the Tariff Act of 1930, and for other purposes; to the Committee on Finance.

Also: introduced in the House January 5: H. R. 1956 (Matthews), similar to S. 28, referred to the Committee on Ways and Means.

TRADE AGREEMENTS PROGRAM REPORT: H. Doc. 93, the first annual report by the President of the United States on the operations of the Trade Agreement Program: referred to the House Committee on Ways and Means, and on February 11 ordered to be printed.

UNEMPLOYMENT RELIEF IN DEPRESSED AREAS: H. R. 1087 (Celler) introduced in the House on January 3, a a bill to establish an effective program to alleviate conditions of excessive unemployment in certain economically depressed areas; to the Committee on Ways and Means. Provides for the establishment of a Depressed Areas Administration. Areas within the United States determined to have existing unemployment of not less than (1) 9 percent of the labor force for at least 18 months, or (2) 6 percent of the labor force for at least three years immediately prior to the date on which application for assistance is made under the act, shall be designated as "depressed areas."

WEATHER STATION IN GULF: H. R. 478 (Thompson of Louisiana) introduced in the House January 3, a bill to provide that one floating station shall be maintained at all times in the Gulf of Mexico to provide storm warnings for States bordering on the Gulf of Mexico; to the Committee on Merchant Marine and Fisheries.

Also: introduced in the House January 10: H. R. 2419 (Colman), similar to H. R. 478.

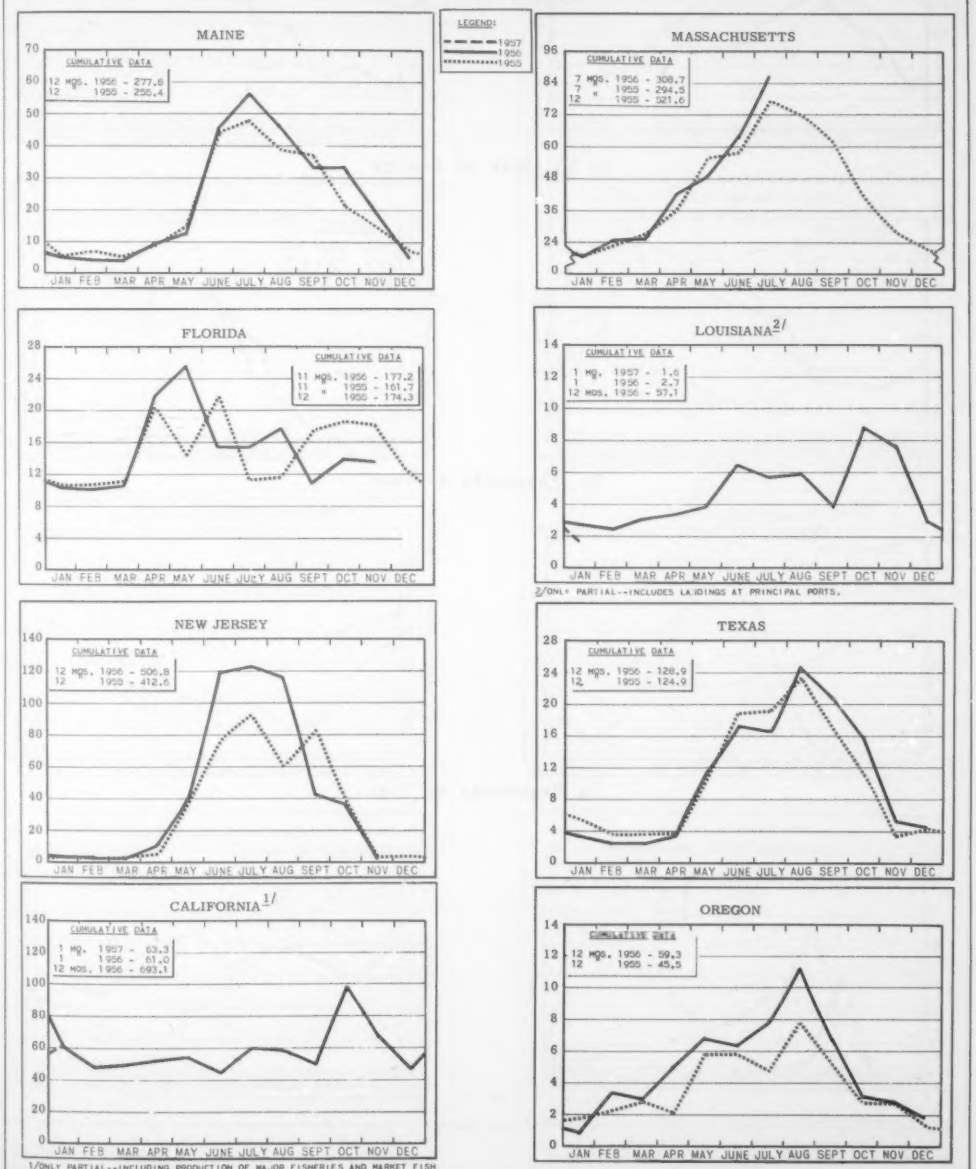
WORK WEEK: H. R. 4696 (Roosevelt) introduced in the House on February 11 a bill to reduce the maximum work week under the Fair Labor Standards Act of 1938, as amended, to 35 hours, and for other purposes; to the Committee on Education and Labor.

Also: introduced in the House February 11: H. R. 4705 (Shelly), February 19: H. R. 5020 (Holland), February 20: H. R. 5121 (Forand); introduced in the Senate February 14: S. 1217 (McNamara)--all similar to H. R. 4696; House bills referred to Committee on Education and Labor and Senate bill to Committee on Labor and Public Welfare.

FISHERY INDICATORS

CHART I - FISHERY LANDINGS for SELECTED STATES

In Millions of Pounds

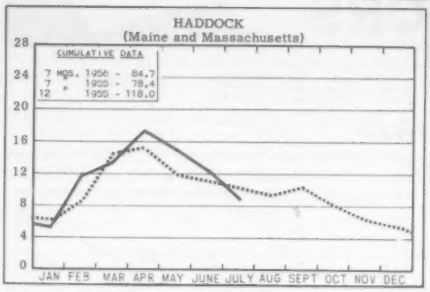


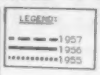
2/ONLY PARTIAL--INCLUDES LANDINGS AT PRINCIPAL PORTS.

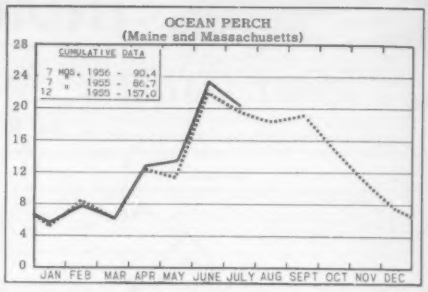
1/ONLY PARTIAL--INCLUDING PRODUCTION OF MAJOR FISHERIES AND MARKET FISH LANDINGS AT PRINCIPAL PORTS.

CHART 2 - LANDINGS for SELECTED FISHERIES

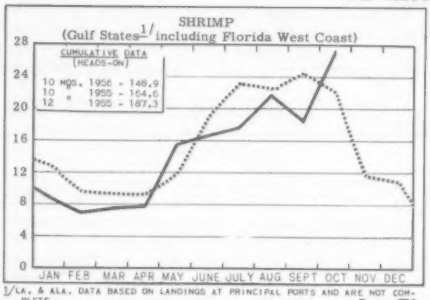
In Millions of Pounds


HADDOCK
(Maine and Massachusetts)
CUMULATIVE DATA
7 MOS. 1956 - 84.7
7 " 1955 - 78.4
12 " 1955 - 118.0
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

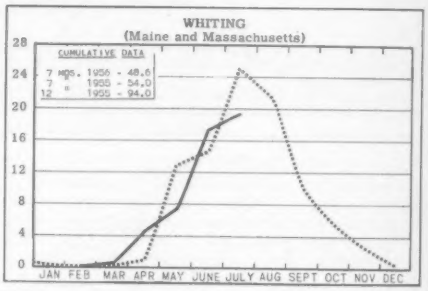



OCEAN PERCH
(Maine and Massachusetts)
CUMULATIVE DATA
7 MOS. 1956 - 90.4
7 " 1955 - 86.7
12 " 1955 - 157.0
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

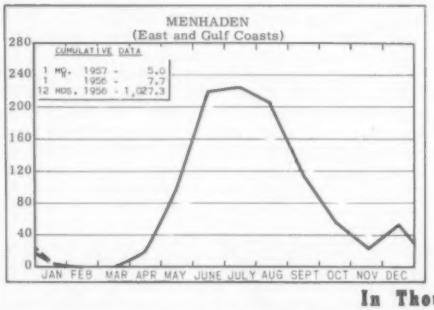
In Millions of Pounds

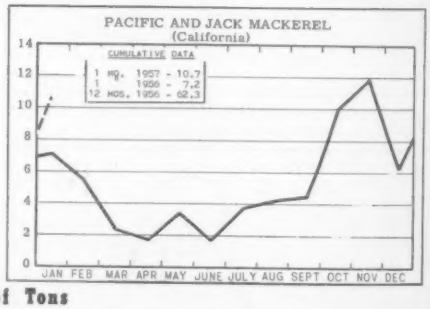

SHRIMP
(Gulf States 1/ including Florida West Coast)
CUMULATIVE DATA
(HEADS-ON)
10 MOS. 1956 - 148.9
10 " 1955 - 164.6
12 " 1955 - 187.3
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

1/LA. & ALA. DATA BASED ON LANDINGS AT PRINCIPAL PORTS AND ARE NOT COMPLETE.

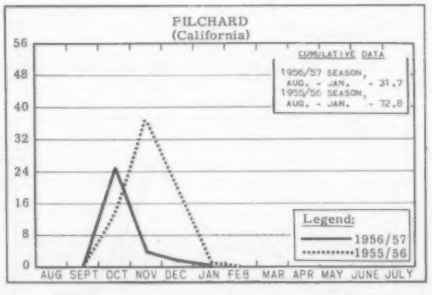

WHITING
(Maine and Massachusetts)
CUMULATIVE DATA
7 MOS. 1956 - 48.6
7 " 1955 - 54.0
12 " 1955 - 94.0
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

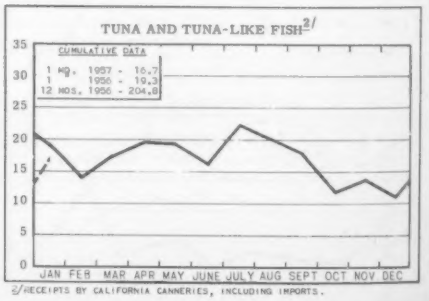
In Thousands of Tons


MENHADEN
(East and Gulf Coasts)
CUMULATIVE DATA
1 MO. 1957 - 5.0
1 " 1956 - 7.7
12 MOS. 1956 - 1,027.3
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC


PACIFIC AND JACK MACKEREL
(California)
CUMULATIVE DATA
1 MO. 1957 - 10.7
1 " 1956 - 7.2
12 MOS. 1956 - 62.3
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

In Thousands of Tons

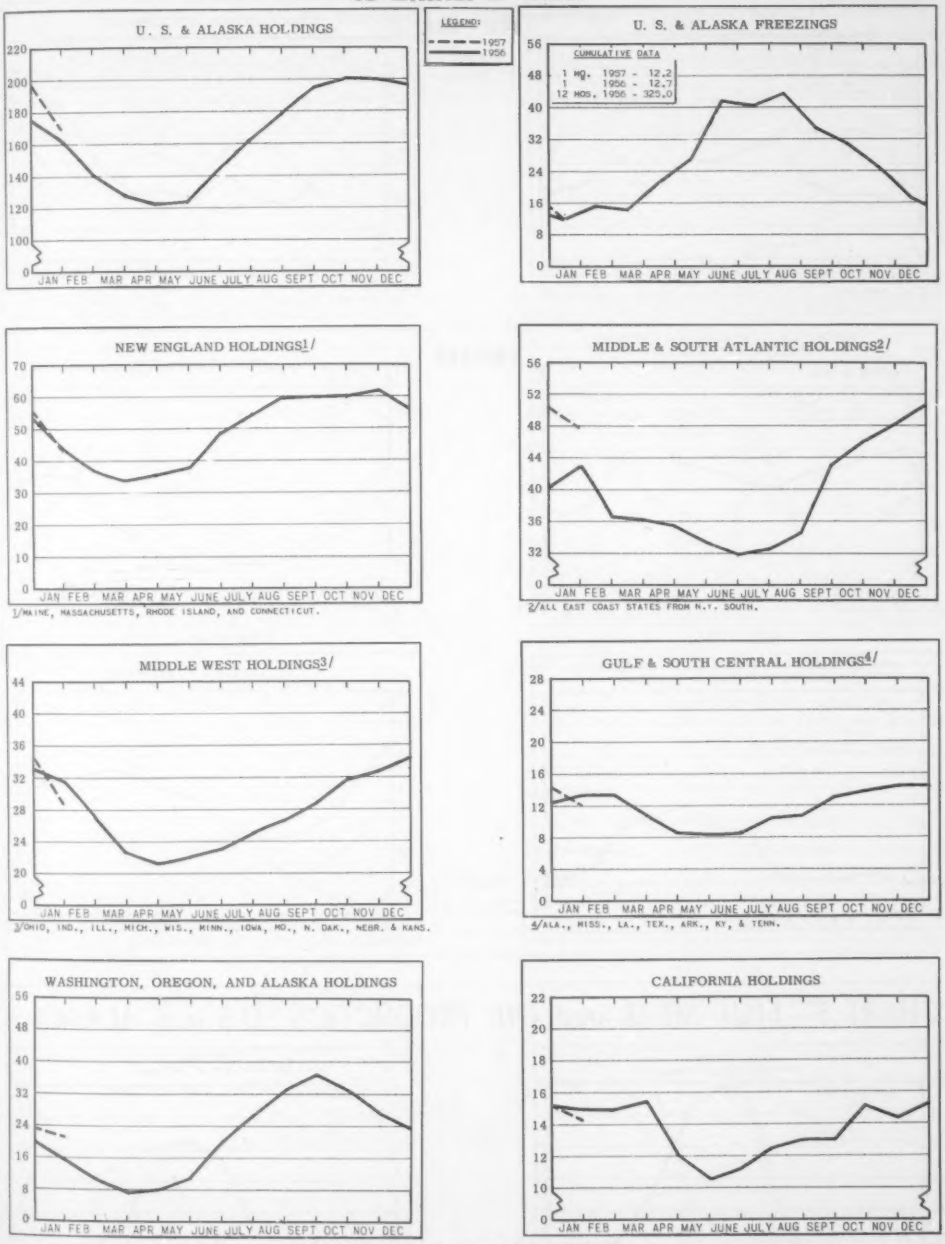



TUNA AND TUNA-LIKE FISH 2/
CUMULATIVE DATA
1 MO. 1957 - 16.7
1 " 1956 - 19.3
12 MOS. 1956 - 204.8
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

2/RECEIPTS BY CALIFORNIA CANNERIES, INCLUDING IMPORTS.

CHART 3 - COLD-STORAGE HOLDINGS and FREEZINGS of FISHERY PRODUCTS *

In Millions of Pounds


U. S. & ALASKA HOLDINGS
LEGEND:
1957
1956
U. S. & ALASKA FREEZINGS
CUMULATIVE DATA
1 MO. 1957 - 12.2
1 1956 - 12.7
12 MOS. 1956 - 325.0
NEW ENGLAND HOLDINGS1/
MIDDLE & SOUTH ATLANTIC HOLDINGS2/
MIDDLE WEST HOLDINGS3/
GULF & SOUTH CENTRAL HOLDINGS4/
WASHINGTON, OREGON, AND ALASKA HOLDINGS
CALIFORNIA HOLDINGS
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC

1/MAINE, MASSACHUSETTS, RHODE ISLAND, AND CONNECTICUT.

2/ALL EAST COAST STATES FROM N.Y. SOUTH.

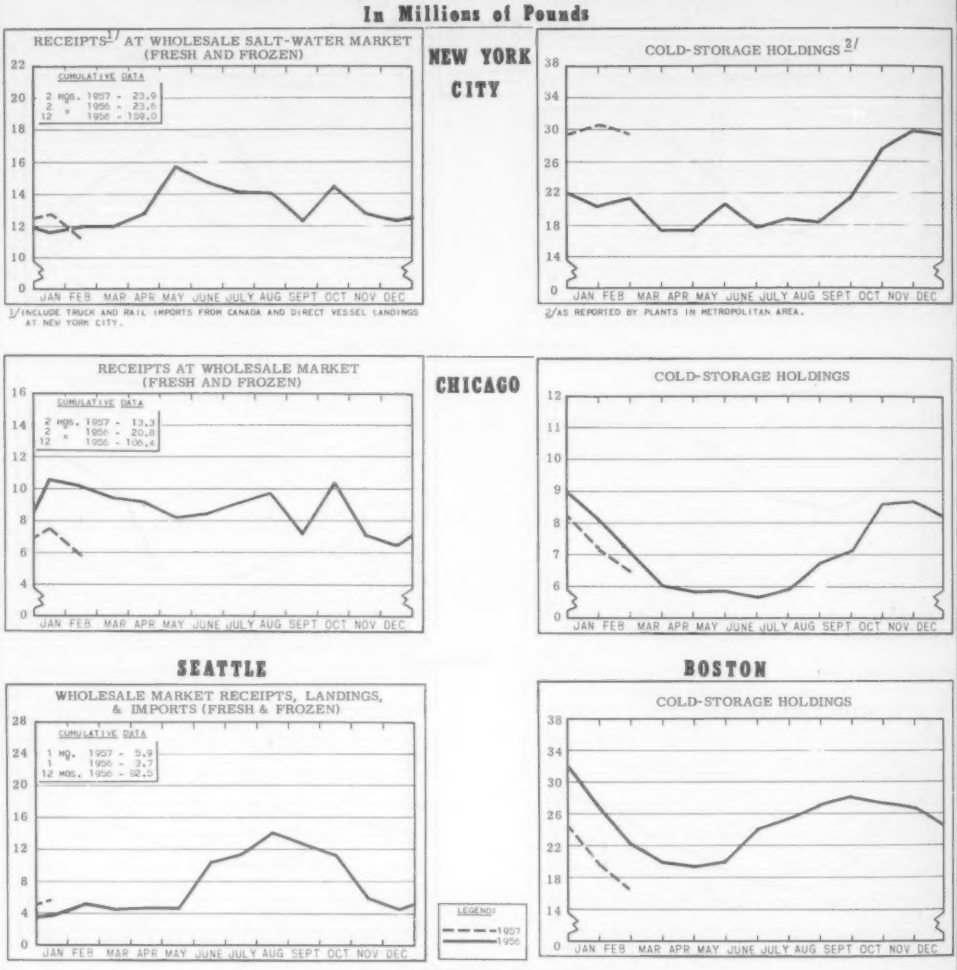
3/OHIO, IND., ILL., MICH., WIS., MINN., IOWA, MO., N. DAK., NEBR. & KANS.

4/ALA., MISS., LA., TEX., ARK., KY, & TENN.

*Excludes salted, cured, and smoked products.

CHART 4 - RECEIPTS and COLD-STORAGE HOLDINGS of FISHERY PRODUCTS at PRINCIPAL DISTRIBUTION CENTERS

In Millions of Pounds


RECEIPTS 1/ AT WHOLESALE SALT-WATER MARKET (FRESH AND FROZEN)
CUMULATIVE DATA
2 MOS. 1957 - 23.9
2 " 1956 - 23.6
12 " 1956 - 159.0
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
NEW YORK CITY
COLD-STORAGE HOLDINGS 2/
RECEIPTS AT WHOLESALE MARKET (FRESH AND FROZEN)
CUMULATIVE DATA
2 MOS. 1957 - 13.3
2 " 1956 - 20.8
12 " 1956 - 106.4
CHICAGO
COLD-STORAGE HOLDINGS
SEATTLE
WHOLESALE MARKET RECEIPTS, LANDINGS, & IMPORTS (FRESH & FROZEN)
CUMULATIVE DATA
1 MO. 1957 - 5.9
1 " 1956 - 3.7
12 MOS. 1956 - 92.5
BOSTON
COLD-STORAGE HOLDINGS
LEGEND
1957
1956

1/ INCLUDE TRUCK AND RAIL IMPORTS FROM CANADA AND DIRECT VESSEL LANDINGS AT NEW YORK CITY.

2/ AS REPORTED BY PLANTS IN METROPOLITAN AREA.

CHART 5 - FISH MEAL and OIL PRODUCTION - U.S and ALASKA

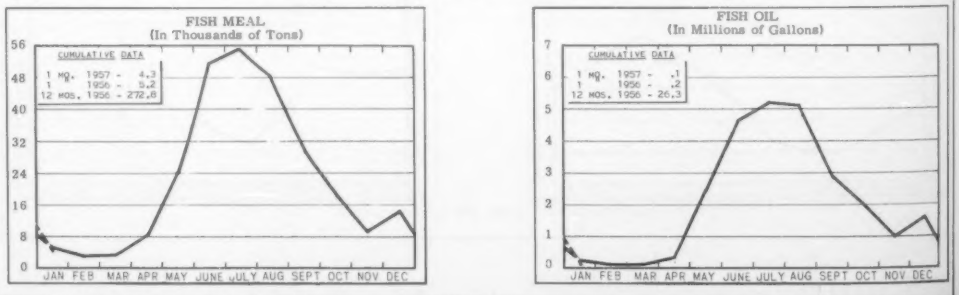
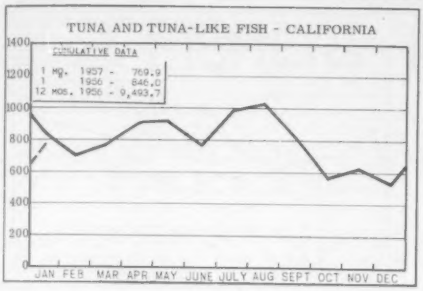
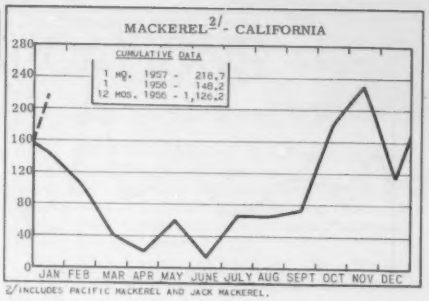

FISH MEAL
(In Thousands of Tons)
CUMULATIVE DATA
1 MO. 1957 - 4.3
1 " 1956 - 9.2
12 MOS. 1956 - 272.8
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
FISH OIL
(In Millions of Gallons)
CUMULATIVE DATA
1 MO. 1957 - .1
1 " 1956 - .2
12 MOS. 1956 - 26.3

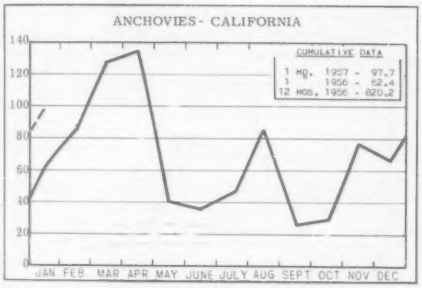
CHART 6 - CANNED PACKS of SELECTED FISHERY PRODUCTS

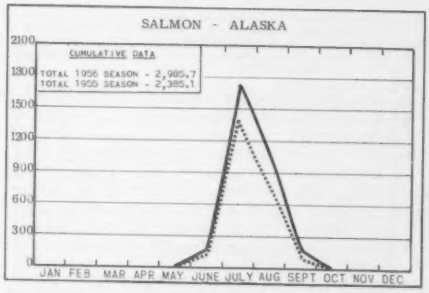
In Thousands of Standard Cases

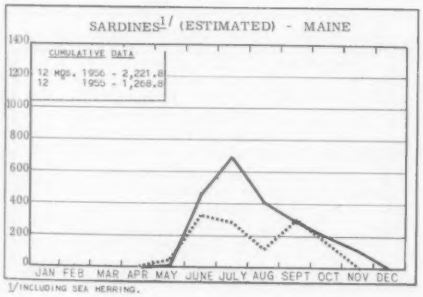




2/ INCLUDES PACIFIC MACKEREL AND JACK MACKEREL.



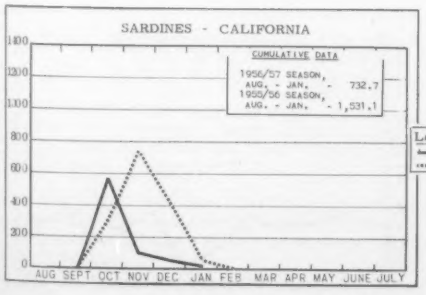


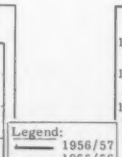


1/ INCLUDING SEA HERRING.

STANDARD CASES

Variety	No. Cans	Can Designation	Net Wgt.
SARDINES	100	¼ drawn	3¼ oz.
SHRIMP.....	48	--	5 oz.
TUNA	48	No. ½ tuna	6 & 7 oz.
PILCHARDS	48	No. 1 oval	15 oz.
SALMON	48	1-pound tall	16 oz.
ANCHOVIES	48	½ lb.	8 oz.





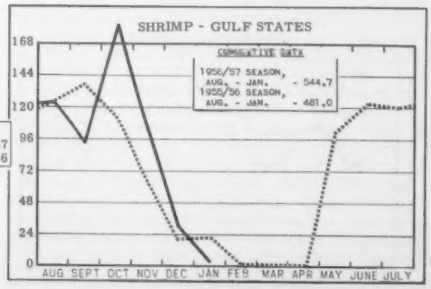
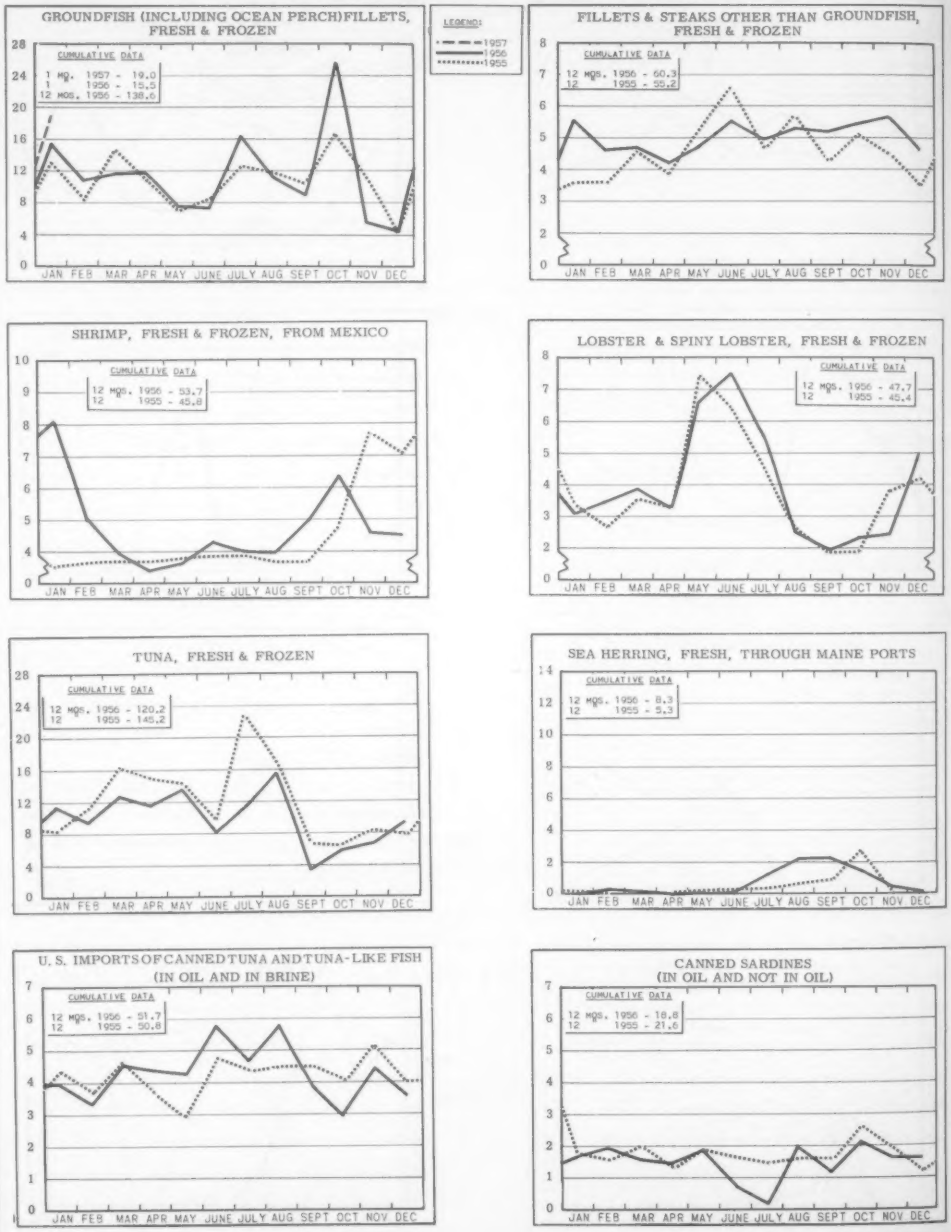
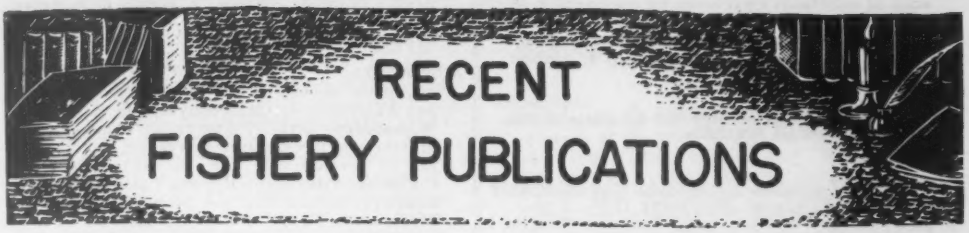


CHART 7 - U.S. FISHERY PRODUCTS IMPORTS

In Millions of Pounds


GROUNDFISH (INCLUDING OCEAN PERCH) FILLETS, FRESH & FROZEN
CUMULATIVE DATA
1 MO. 1957 - 19.0
1 " 1956 - 15.5
12 MOS. 1956 - 138.6
LEGEND:
1957
1956
1955
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC
FILLETS & STEAKS OTHER THAN GROUNDFISH, FRESH & FROZEN
CUMULATIVE DATA
12 MOS. 1956 - 60.3
12 " 1955 - 55.2
SHRIMP, FRESH & FROZEN, FROM MEXICO
CUMULATIVE DATA
12 MOS. 1956 - 53.7
12 " 1955 - 45.8
LOBSTER & SPINY LOBSTER, FRESH & FROZEN
CUMULATIVE DATA
12 MOS. 1956 - 47.7
12 " 1955 - 45.4
TUNA, FRESH & FROZEN
CUMULATIVE DATA
12 MOS. 1956 - 120.2
12 " 1955 - 145.2
SEA HERRING, FRESH, THROUGH MAINE PORTS
CUMULATIVE DATA
12 MOS. 1956 - 8.3
12 " 1955 - 5.3
U. S. IMPORTS OF CANNED TUNA AND TUNA-LIKE FISH (IN OIL AND IN BRINE)
CUMULATIVE DATA
12 MOS. 1956 - 51.7
12 " 1955 - 50.8
CANNED SARDINES (IN OIL AND NOT IN OIL)
CUMULATIVE DATA
12 MOS. 1956 - 18.8
12 " 1955 - 21.6



FISH AND WILDLIFE SERVICE PUBLICATIONS

THESE PROCESSED PUBLICATIONS ARE AVAILABLE FREE FROM THE DIVISION OF INFORMATION, U. S. FISH AND WILDLIFE SERVICE, WASHINGTON 25, D. C. TYPES OF PUBLICATIONS ARE DESIGNATED AS FOLLOWS:

CFS - CURRENT FISHERY STATISTICS OF THE UNITED STATES AND ALASKA.
SL - STATISTICAL SECTION LISTS OF DEALERS IN AND PRODUCERS OF FISHERY PRODUCTS AND BYPRODUCTS.
FL - FISHERY LEAFLETS.
SSR.- FISH.- SPECIAL SCIENTIFIC REPORTS--FISHERIES (LIMITED DISTRIBUTION).
SEP.- SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW.

Number Title

CFS-1442 - Massachusetts Landings, July 1956, 4 pp.
CFS-1451 - Frozen Fish Report, November 1956, 7 pp.
CFS-1457 - Rhode Island Landings, August 1956, 2 pp.
CFS-1458 - Maine Landings, October 1956, 3 pp.
CFS-1459 - Ohio Landings, November 1956, 1 pp.
CFS-1462 - North Carolina Landings, November 1956, 2 pp.

Wholesale Dealers in Fishery Products (Revised):
SL- 7 - New Jersey, 1956, 4 pp.
SL-22 - Oregon, 1956, 4 pp.
SL-23 - Washington, 1956, 7 pp.
SL-24 - Minnesota, Lakes Area, 1956, 1 p.
SL-28 - Michigan, 1956, 4 pp.
SL-34 - Wisconsin, Mississippi River and Tributaries Area, 1956, 2 pp.
SL-36 - Iowa, Mississippi River and Tributaries Area, 1956, 2 pp.
SL-39 - Tennessee, 1956, 1 p.
SL-40 - Oklahoma, 1956, 1 p.
SL-41 - Arkansas, 1956, 1 p.
SL-43 - Alabama, Mississippi River and Tributaries Area, 1956, 1 p.

FL -437 - Assembly Methods for Otter-Trawl Nets, 29 pp., December 1956.
FL -438 - Fishery Motion Pictures, 16 pp., 1956.

SSR-Fish. No. 186 - Sardine Eggs and Larvae and Other Fish Larvae, Pacific Coast, 1954, by Elbert H. Ahlstrom and David Kramer, 79 pp., processed, November 1956.

SSR-Fish. No. 188 - Relative Areal Zooplankton Abundance off the Pacific Coast, by James R. Thrailkill, 87 pp., illus., processed, November 1956.

Sep. No. 464 - Development of "Honeycombing" in Hawaiian Skipjack Tuna.
Sep. No. 465 - Shrimp Explorations Off the Washington Coast, Fall 1955 and Spring 1956.
Sep. No. 466 - Chemical Compounds Formed During the Spoilage of Fish.
Sep. No. 467 - Technical Note No. 36 - Determining Fish Content of Frozen Fried Fish Sticks.

THE FOLLOWING SERVICE PUBLICATIONS ARE FOR SALE AND ARE AVAILABLE ONLY FROM THE SUPERINTENDENT OF DOCUMENTS, WASHINGTON 25, D. C.

"Fish Foods Purchased for Federal Hatcheries in 1955, Compared with 1945 and 1949," by William Hagen, Jr., article, The Progressive Fish-Culturist, vol. 19, no. 1, January 1957, pp. 32-39, processed, single copy 25 cents. Statistics are given on the quantity and cost of the various kinds of fish food purchased for Federal hatcheries in 1955, compared with 1945 and 1949. The constantly increasing requirement for catchable-size trout for the stocking of Federal waters and the expansion of the salmon program to meet the threat of dams on the west coast were responsible for the greatly increased production. The expansion of existing facilities and the erection of a few new hatcheries provided the space for additional production. Also to be considered is the dietary improvement that resulted in a more favorable conversion of food to fish, as well as the ability to produce more pounds of fish per cubic foot of rearing space, and per gallon of water inflow, with more modern methods.

"Production During Intensive Carp Culture in Japan," by N. Y. Kawamoto, article, The Progressive Fish-Culturist, vol. 19, no. 1, January 1957, pp. 26-31, illus., processed, single copy 25 cents. Describes a study of the relation between the productive capacity and the various conditions of a farm or pond in Japan, famous for intensive carp culture. Various conditions of an intensively managed carp farm were studied, and its productivity was considered from the physiological point of view. The rate of production of carp was higher in this farm than in any other farm in Japan. There was much more oxygen in the water entering the ponds than was needed by the carp. The author states that, "Because of the high values of pH in the water, it is believed that in these ponds carbon dioxide did not affect the carp. The rate of production in the ponds may have been affected by the pres-

ence of substances excreted by the carp. It is believed that, for increased production of carp, removal of excretory substances is more important than factors such as oxygen or carbon dioxide in the water."

THE FOLLOWING SERVICE PUBLICATIONS ARE AVAILABLE ONLY FROM THE SPECIFIC OFFICE MENTIONED.

Gulf Monthly Landings, Production, and Shipments of Fishery Products, December 1956, 5 pp. (Market News Service, U.S. Fish and Wildlife Service, 609-611 Federal Bldg., New Orleans 12, La.) Gulf States shrimp, oyster, finfish, and blue crab landings; crab meat production; LCL express shipments from New Orleans; and wholesale prices of fish and shellfish on the New Orleans French Market; for the month indicated.

(New York) Monthly Summary-October 1956--Receipts of Fishery Products at the New York City Wholesale Salt-Water Market, 4 pp.; Monthly Summary-November 1956--Receipts of Fishery Products at the New York City Wholesale Salt-Water Market, 4 pp.; Monthly Summary-December 1956--Receipts of Fishery Products at the New York City Wholesale Salt-Water Market, 4 pp. (Market News Service, U.S. Fish and Wildlife Service, 155 John St., New York 38, N.Y.) Receipts in the salt-water section of the Fulton Fish Market by species and by states and provinces for the months indicated.

Monthly Summary of Fishery Products Production in Selected Areas of Virginia, North Carolina, and Maryland, December 1956, 4 pp. (Market News Service, U.S. Fish and Wildlife Service, 18 So. King St., Hampton, Va.) Fishery production for the Virginia areas of Hampton Roads, Lower Northern Neck, and Eastern Shore; the Maryland areas of Crisfield, Ocean City, and Cambridge; and the North Carolina areas of Atlantic, Beaufort, and Morehead City; together with cumulative and comparative data; for the month indicated.

(Chicago) October 1956 Monthly Summary of Chicago's Fresh and Frozen Fishery Products Receipts and Wholesale Market Prices, 10 pp.; November 1956 Monthly Summary of Chicago's Fresh and Frozen Fishery Products Receipts and Wholesale Market Prices, 10 pp. (Market News Service, U.S. Fish and Wildlife Service, 565 W. Washington St., Chicago 6, Ill.) Receipts at Chicago by species and by states and provinces; freshwater fish, shrimp, and frozen fillet wholesale market prices for the months indicated.

MISCELLANEOUS PUBLICATIONS

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ANTIBIOTICS:

International Conference on the Use of Antibiotics in Agriculture, 1st, 1955, National Research Council Publication 397, 278 pp., illus., printed. National Acadamy of Sciences, National Research Council, Washington, D.C., 1956.

AUSTRALIA:

"A Critical Survey of the Marine Algae of Southern Australia. I. Chlorophyta," by H. B. S. Womersley, article, Australian Journal of Marine and Freshwater Research, vol. 7, no. 3, October 1956, pp. 343-383, printed. Commonwealth Scientific and Industrial Research Organization, 314 Albert St., East Melbourne, C.2, Victoria, Australia. This paper is a survey of all the known marine Chlorophyta of southern Australia, from the southwest corner of Western Australia to about the Victoria-New South Wales border, and including Tasmania. Full references to each species are given, all established synonomy, the type of locality of each species and where the type specimen is deposited, and a summary of the known distribution. Critical notes on many species are given also.

BROWN TROUT:

"Spawning Habits of Brown Trout," newspaper article, The Times, October 26, 1956, 1 p., The Times, London, England. Briefly describes research with brown trout which will lead to accurate predictions of fish spawning sites in streams and elimination of harmful gravels at those sites.

CANNING:

Current Technological Problems in Fish Canning, by Dr. Ernest Hess, 20 pp., printed. (Pre-printed from FAO Fisheries Bulletin, vol. IX, no. 4, October-December 1956.) Food and Agriculture Organization of the United Nations, Rome, Italy. Discusses specific problems characteristic of the fish canning industry. Deals primarily with the quality, handling, and preparation of the raw fish, mollusks, and crustaceans; relationships of container to contents; fish canning operations; and the effect of heat processing and storage on the quality of canned fishery products.

DISEASES OF FISH:

Diseases of Fishes of the Western North Atlantic (IV. Fungus Disease and Resultant Mortalities of Herring in the Gulf of Saint Lawrence in 1955), by Carl J. Sindermann, Research Bulletin No. 25, 23 pp., illus., printed. Department of Sea and Shore Fisheries, Vickery-Hill Bldg., Augusta, Maine.

FISHING EFFORT:

On the Fishing Effort in English Demersal Fisheries, by J. A. Gulland, Ministry of Agriculture, Fisheries and Food Fishery Investigations, Series II, vol. XX, no. 5, 45 pp., illus., printed, 7s. 6d. (US$1.05). Her Majesty's Stationery Office, York House, Kingsway, London W.C.2, England, 1956. The author states that, "In the study of an exploited fish population a most important factor is the fishing effort expended. Together with a knowledge of the commercial catch, the effort may be used to calculate the catch-per-unit-effort, which provides one of the most useful and widely applied indices of abundance of the exploited stock. A knowledge of the effort is even more important when assessing the relations between

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the activities of the commercial fleet and the mortality observed in the fish stock, and hence in evaluating the possibility of overfishing and the effects of any conservation measures." The opinions of other investigators of fishing effort and fishing power are defined in the introduction of this paper, followed by chapters on calculation of fishing power; the relation of fishing power of trawlers to vessel characteristics; the fishing power of seiners; the fishing power of parejas; the relation of fishing power and performance; comparison with other results; the measurement of fishing time; and the effort and catch per unit of effort off Iceland.

FLORIDA:

Florida, Fresh-Water Fish and Fishing, 1 v., printed. Game and Fresh Water Fish Commission, Tallahassee, Fla.

Quarterly Report on Fisheries Research, September 1956, no. 56-25, 16 pp., processed. The Marine Laboratory, University of Miami, Coral Gables, Fla. Statistics are given on landings of some major species of fish and shellfish for the first six months of 1956 and 1955. Contains a brief summary of the mullet marketing study and recommendations for the minimum size of mesh in shrimp trawls. The use of sodium bisulfite to control shrimp black spot, and fish rancidity and pigmentation studies are described. Also, describes progress in the game-fish and spear-fishing surveys and other projects.

GAME FISH:

Saltwater Game Fish Research Newsletter, #8, edited by Robert W. Ellis, 8 pp., processed. The Marine Laboratory, University of Miami, Coral Gables 34, Fla., Oct. 1956. Features brief progress reports on game-fish research projects being conducted at the Marine Laboratory and topics of general interest to anglers.

GEAR:

The Effect of Electric Fields on Marine Fishes, by B. McK. Bary, Scottish Home Department Series No. 1, 32 pp., illus., printed. H. M. S. O., York House, Kingsway, London W. C. 2, England.

"How to Tan Nets, Sails, and Lines," H. Van Pel, article, SPC Quarterly Bulletin, vol. 6, no. 3, July 1956, p. 33, illus., printed. South Pacific Commission, Noumea, New Caledonia. The life of fishing nets, sails, and lines can be greatly prolonged by tanning. This article explains a simple way of carrying out this process, using a tanning solution made from the bark of the mangrove tree, found on most islands of the South Pacific.

"Purse Seining for Pilchards in Brittany," by C. M. Good, article, World Fishing, vol. 5, no. 11, November 1956, pp. 30-32, illus., printed. John Trundell Ltd., Temple Avenue, London E. C. 4, England. Describes in detail the purse seine used by the French pilchard fishermen. A sketch of the gear illustrates the construction of the net and another drawing illustrates the method of pursing used on French pilchard fishing vessels. The "chumming" techniques, using a mixture of Norwegian salt cod roe and peanut meal; the method of setting the gear; and the method of handling the catch are also described.

GENERAL:

(Atlantic States Marine Fisheries Commission) Minutes of the 15th Annual Meeting (September 21-22, 1956, Atlantic City, New Jersey), 205 pp., processed. Atlantic States Marine Fisheries Commission, 22 West First St., Mount Vernon, N. Y. Presents the minutes of the 15th annual meeting of the Commission with details of attendance, the first general session, and section and joint meetings of the North Atlantic-Middle Atlantic Sections and the Chesapeake Bay-South Atlantic Sections.

Anuario de las Industrias Pesqueras del Peru, Año 1951 (Annual Report of Peruvian Fishing Industries for 1951), 80 pp., illus., printed in Spanish. Comite de Pesca de la Sociedad Nacional de Industrias, Lima, Peru.

How the Department of Justice Helps Small Business, Small Marketers Aids No. 17, 4 pp., processed. Small Business Administration, Washington 25, D. C., November 1956.

International Commission for the Northwest Atlantic Fisheries, Annual Proceedings for the Year 1955-56, vol. 6, 74 pp., illus., printed. International Commission for the Northwest Atlantic Fisheries, Halifax, N. S., Canada, 1956. This bulletin presents the administrative report of the Commission for the year ending June 30, 1956, including financial statements; a report of the Sixth Annual Meeting of the Commission, June 11-15, 1956; summaries of research during 1955 broken down by country; and a compilation of research reports by subareas for 1955.

(International Cooperation Administration) Operations Report, Data as of June 30, 1956, FY 1956, Issue No. 4, 90 pp., illus., processed. Office of Statistics and Reports, International Cooperation Administration, Washington, D. C.

Man and the Underwater World, by Pierre de Latil and Jean Rivoire (translated from the French by Edward Fitzgerald), 400 pp., illus., printed. Jarrolds Publishers Ltd., 178-202 Great Portland St., London, England. This generously illustrated book traces the history of man's relationship to the sea from the dawn of civilization to the present. It endeavors to summarize broadly the past efforts to probe the mysteries of the underwater world which led to the eventual development of the diving equipment of today. The first six chapters dwell mostly on mythology, fables, legends, and observations of the sea from ancient times to the Renaissance. The succeeding chapters discuss: diving inventions of the Middle Ages; development of the diving-suit; beginnings of the science of oceanography; history of pearl diving; underwater explorations with spherelike diving chambers; invention of the aqualung; limits, dangers, and many advantages of skin diving; results of trawling in depths over 33,000 feet; depth ships; and speculations about underwater tourism and other such activities in future.

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM.

A New Method for Long Term Preservation of Wood by Chemical Modification, by F.G. Walton Smith, Robert R. Bottoms, Edward Abrams, and Sigmund M. Miller, no. 1025, 6 pp., illus., printed. (Reprinted from Forest Products Journal, vol. VI, no. 9, September 1956, pp. 340-345.) Forest Products Research Society, P.O. Box 2010, University Station, Madison 5, Wisc.

Yachting World Annual 1957, 192 pp. (incl. 82 photos and 155 text illus.), $10. Philosophical Library, 15 E. 40th St., New York, N.Y., 1956. This book will interest all who have an interest in the sea. It contains articles on sailing and motor-boating. Developments in the small boat class are discussed. One article deals with the science of yacht design, and other articles cover the use of plastics for boats. In addition, the principal events of the year and reviews of yachting are covered. A design section contains plans and photographs of more than 50 yachts of all types designed by leading designers. Some of the chapters of interest to fishing interests are on science and the sailing yacht, plastics, small boats, ocean cruising, and dinghies.

GERMANY:

Jahresbericht ïber die Duetsche Fischerei 1955 (Annual Report of the German Fisheries 1955), 279 pp., illus., printed in German with summaries in English, DM 20 (US$4.80). Bundesministerium fur Ernahrung, Landwirtschaft und Forsten, in cooperation with Mitwirkung des Statisticschen Bendesamtes, Neuerwall 72, Hamburg 36, Germany (Publisher: Mann Bros., Berlin, Germany), October 1956. Presents 1955 statistics for fishery landings and imports in considerable detail as well as the number of vessels, new building, personnel employed, etc. In the section devoted to the main fishing ports of Bremerhaven, Cuxhaven, Hamburg-Altona, and Kiel, details are given of the firms operating trawlers, together with the number operated and the type.

GOLD COAST:

"Marine Fish Fauna of the Gold Coast," by Dr. E.A. Salzen, article, Nature, vol. 178, no. 4542, November 17, 1956, pp. 1105-1106, printed. Macmillan & Co., Ltd., St. Martin's St., London W.C.2, England. Part of the work of the West African Fisheries Research Institute is to explore the whole of the West African continental shelf for potential trawling grounds, and to determine the nature and extent of such grounds for possible future exploitation. A recent survey, described in this article, gave results which are of considerable interest because of their similarity with those obtained off French Guinea. A brief description of the results of the survey, which covered the whole of the shelf for 20 miles on either side of the port of Tema, is presented with a list of the species of fish of economic importance in this area.

HALIBUT:

The Incidental Capture of Halibut by Various Types of Fishing Gear, by F. Heward Bell, Report of the International Pacific Halibut Commission, No. 23, 28 pp., illus., printed. International Pacific Halibut Commission, Seattle, Wash., 1956. Deals with conservation and regulatory problems associated with the incidental catching of halibut by vessels primarily engaged in fishing for other species. Reviews the terms under which vessels using set-line gear have been permitted to retain halibut caught incidentally to other fishing in areas closed to regular halibut fishing. Also records and evaluates the facts that have been gradually accumulated by and available to the Commission in considering the regulation of the capture of halibut caught incidentally by vessels using set-line, troll, and bottom trawl net gear while fishing for other species.

Regulation and Investigation of the Pacific Halibut Fishery in 1955, Report of the International Pacific Halibut Commission No. 24, 15 pp., illus., printed. International Pacific Halibut Commission, Seattle, Wash., 1956. A brief report of activities of the Commission during 1955 which discusses the historical background of the Commission, 1955 regulations, statistics of the fishery, multiple open seasons, catch per unit of fishing effort, composition of catches, subcommercial size halibut, and tagging experiments.

HERRING:

Herring Tagging Techniques and Results, Rapports et Proces-Verbaux des Reunions (Reports and Verbal Proceedings of Meetings), vol. 140, part II, 54 pp., illus., printed in French and English, Kr 15 (US$2.90). Conseil Permanent International pour l'Exploration de la Mer (International Council for Exploration of the Sea), Charlottenlund Slot, Denmark, December 1955.

JAPAN:

Annual Report of Catch Statistics on Fishery and Aquiculture, 1955, Agriculture, Forestry and Fishery Statistics Bulletin 31-9, 281 pp., illus., printed in Japanese and English. Association of Agriculture-Forestry Statistics, No. 4, 1-chome, Onden, Shibuya-ku, Tokyo, Japan, September 1956. This report contains production statistics of fisheries, aquiculture, and processing of aquatic products for 1955. A general description of the survey methods and explanation of each statistical table is presented. Statistics given are: fish species and prefecture; type of fishery and prefecture; type of fishery and fish species; type of fishery, stratum, and prefecture; and monthly statistics by fish species, type of fishery, and prefecture. Appendices cover pelagic fishery on the high seas; domestic marine fishery; inland water fishery; aquiculture in shallow sea and in inland water; and statistics of processing. Illustrations and names of principal species of fish in Japan are also included.

KENYA:

Review of Kenya Fisheries, 1955, by Hugh Copley, 47 pp., illus., printed. The Government Printer, Nairobi, Kenya, 1956. Reviews the Kenya fisheries for 1955, with special reference to the river fisheries, hatchery work, fish-culture farm, and marine fisheries. The report on the marine fisheries discusses production, marketing, and exploratory and experimental work.

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It also describes the turtle fishery, processing of some shark products, application of synthetic nets and twines to fisheries, and whether or not the use of powered craft would be of economic advantage to the existing inshore fishery.

MANAGEMENT:
Managing Our Fish and Wildlife Resources (Institute), Jan. 19-20, 1956, Minneapolis Center for Continuation Study, 74 pp., illus., printed. University of Minnesota, Minneapolis, Minn., 1956.

MUSSELS:
The Great Spatfall of Mussels (MYTILUS EDULIS L.) in the River Conway Estuary in Spring 1940, by R.E. Savage, Ministry of Agriculture, Fisheries and Food Fishery Investigations, Series II, vol. XX, no. 7, 27 pp., illus., printed, 5 s. (70 U.S. cents). Her Majesty's Stationery Office, York House, Kingsway, London W.C.2, England, 1956.

A Simplified System of Mussel Purification, by Nial Reynolds, Ministry of Agriculture, Fisheries and Food Fishery Investigations, Series II, vol. XX, no. 8, 22 pp., illus., printed, 5 s. (70 U.S. cents). Her Majesty's Stationery Office, York House, Kingsway, London W.C.2, England, 1956.

NEW ZEALAND:
Fisheries, 38 pp., printed. (Extract from Parliamentary Paper H.15, 1956.) Marine Department, Wellington, New Zealand, 1956. A report on the fisheries of New Zealand which discusses spiny lobster or crayfish, fishing vessels and personnel, fish landings, methods of capture, landings at ports, ports in review, exports and imports, big-game fishing, fish liver oil, oysters, toheroa, whitebait, mussels, fresh-water fisheries and research, marine research, and legislation. Included also are statistical tables of detailed data on fisheries.

OYSTERS:
The Growth of Oysters Parasitized by the Fungus DERMOCYSTIDIUM MARINUM and by the Trematode BUCEPHALUS CUCULUS, by R. Winston Menzel and Sewell H. Hopkins, 10 pp., illus., printed. (Reprinted from The Journal of Parasitology, vol. 41, no. 4, August 1955, pp. 333-342.) Department of Biology, A. & M. College of Texas, College Station, Tex.

OYSTER PESTS:
"Oyster Pests of Past Ages," by Percy Viosca, Jr., article, Louisiana Conservationist, vol. 8, no. 12, November 1956, pp. 6-9, illus., printed. Louisiana Wild Life and Fisheries Commission, 126 Civil Courts Bldg., New Orleans, La.

PORTUGAL:
Gremio dos Armadores da Pesca de Arrastro, Relatorio e Contas do Exercicio de 1955 e Orcamento para 1956 (Trawler Owners' Guild, Statement of Operations for 1955 and Budget for 1956), 48 pp., printed in Portuguese. A Comissao Revisora de Contas, Lisbon, Portugal.

PRESERVATION:
Der Fisch vom Fang bizum Verbrauch (The Fish from Catch to Consumption), by W. Ludorff and R. Kreuzer, 98 pp., illus., printed in German. Carl Th. Görg Verlag, Bremerhaven, West Germany, 1956.

Smoke Flavor and Ascorbic Acid as Preservatives for Fatty Fish, by Anna Marie Erdman, Betty M. Watts, and Loretta C. Ellias, 4 pp., printed. (Reprinted from Food Technology, vol. VIII, no. 7, 1954, pp. 320-323.) Oceanographic Institute, Florida State University, Tallahassee, Fla. Results of tests of smoke flavors to determine their preservative effect on fatty fish are reported. The fish were lightly salted and kept under refrigeration. The smoke flavors were tested alone and also in combination with ascorbic acid. Observations on the bacteriostatic effect of the smoke flavor on several typical organisms are also reported.

REFRIGERATION AND FREEZING:
Le Poisson Congele. Qualite et Emballage, Facteurs du Developpement du Marche et de la Consommation (Frozen Fish. Quality and Wrapping, Factors of Market and Consumption Development), 171 pp., illus., printed. Agence Europeenne de Productivite de l'O.E.C.E., 2, rue Andre-Pascal, Paris (16e), France. A report of the working session devoted to the improvement of quality and packaging of frozen fish. This session was held in Kiel, Germany, on March 14-19, 1955, and was sponsored by the European Productivity Agency. The first part of the report is a survey of the frozen fish industry in the various participating countries. In the second part, the full text of the papers read at the meetings and a summary of the discussions are given. The papers discussed were: handling and processing of fish for freezing; technical problems in the freezing of fish; technical problems in the packaging and storage of frozen fish; practical problems in the preservation of the quality of frozen fish during storage; transport and delivery of frozen fish; marketing and economic problems related to the production and delivery of frozen fish; and inspection of the quality of fish and fish products in Denmark, particularly in regard to frozen fish.

EL SALVADOR:
Sea Fishing and Hunting Act, Food and Agricultural Legislation XVI. 3/55.1, vol. V, no. 1, 1956, 7 pp., printed, single copy $1. Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N.Y.

SHRIMP:
Deteriorative Changes in Frozen Shrimp and Their Inhibition, by Marian B. Faulkner and Betty M. Watts, 4 pp., printed. (Reprinted from Food Technology, vol. IX, no. 12, 1955, pp. 632-635.) Department of Food and Nutrition, Florida State University, Tallahassee, Fla. Describes briefly the changes which take place in shrimp during freezer storage and a method of restraining loss of color, odor, and flavor by use of ascorbic acid.

Enzymatic Darkening of Shrimp, by Marian B. Faulkner, Betty M. Watts, and Harold J. Humm, 9 pp., printed. Department of Food and Nutrition, Oceanographic Institute, Florida State

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University, Tallahassee, Fla. Briefly reports evidence of the cause of "black spot" and discusses methods of bleaching and controlling blackening of fresh shrimp.

The Texas Shrimp Fishery, by William C. Guest, Bulletin No. 36, Series No. V, Marine Laboratory, 23 pp., illus., printed. Texas Game and Fish Commission, Austin, Texas, 1956. A summary of the information available on the many phases of shrimp biology and the commercial fishery in Texas. Describes and illustrates the different types of shrimp that occur in the Gulf of Mexico and in Texas bays and gives the distinguishing characteristics of the commercial shrimp. Also describes briefly the life histories of the commercial shrimp; the commercial shrimp fishery; shrimp operations; shrimp trawl, webbing, construction, and measurement; and the bait shrimp fishery.

TARIFFS AND TRADE:

General Agreement on Tariffs and Trade--Third Protocol of Supplementary Concessions, Treaties and Other International Acts Series 3629, 14 pp., processed, 10 cents. Department of State, Washington, D.C., 1956. (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.)

General Agreement on Tariffs and Trade--Fourth Protocol of Supplementary Concessions, Treaties and Other International Acts Series 3630, 13 pp., processed, 10 cents. Department of State, Washington, D.C., 1956. (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.)

TERRITORIAL WATERS:

(International Law Commission) Report of the International Law Commission on the Work of its Eighth Session, A/C.6/L.378, October 25, 1956, 248 pp., processed. United Nations, International Law Commission, New York, N.Y. A reference guide to the articles concerning the Law of the Sea adopted by the International Law Commission at its eighth session.

TRANSPORTATION:

Food Transportation and What It Costs Us, Miscellaneous Publication No. 738, 23 pp., illus., printed, 15 cents. Marketing Research Division, Agricultural Marketing Service, U.S. Department of Agriculture, Washington, D.C., November 1956. (For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D. C.) Describes the different methods of food transportation, the proportion of the food dollar that goes to pay for transportation, transportation costs to consumers, the share charged for supplemental services, and recent trends in transportation charges.

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KNOT

"Knot" is a unit of velocity equal to one nautical mile (about 6,080 feet) an hour. The term was used in former times when a knotted line and old-fashioned sand glass were the equipment used to estimate the speed of a vessel.

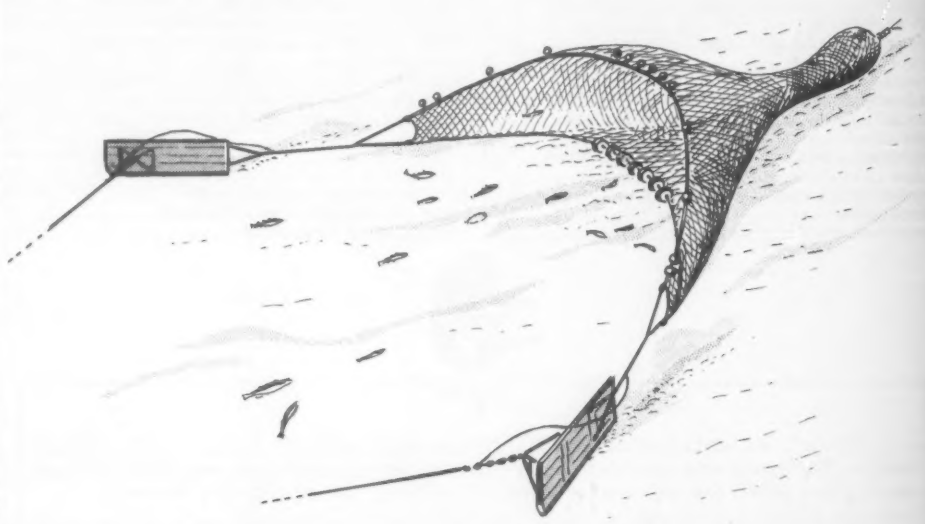
The sand glasses used were similar to those sometimes employed nowadays for timing the boiling of an egg, in which the proper time for cooking was measured by the time taken for sand to run down from one end of a two-bulbed glass to the other. A common sand glass used at sea had sufficient sand to require 28 seconds to run down.

The line had a zero mark and at intervals of about 47 feet was knotted with pieces of string or rag. One end of the line, with a chip of wood attached, was thrown overboard. As the zero mark passed the rail the glass was inverted and the number of knots that ran out were counted during the time taken for the sand to run down. Since the distance between knots was the same proportion to a nautical miles as 28 seconds to an hour, the number of knots was equal to the speed of the ship in nautical miles per hour. Thus the number of nautical miles an hour is designated as the number of knots, and it is incorrect to say "knots per hour."

--Sea Secrets, The Marine Laboratory, University of Miami, Coral Gables, Fla.

ASSEMBLY METHODS FOR OTTER-TRAWL NETS

Fishery Leaflet 437 (Assembly Methods for Otter-Trawl Nets) describes with a minimum of text and many illustrations the type and assembly of standard trawl nets. "The proper assembly of the otter trawl is one of the most difficult problems faced by trawler fishermen," points out the author. Improper hanging of the otter trawl net reduces the efficiency of the otter trawl considerably. Efficient fishing performance of the trawl net is contingent upon proper and precise assembly of web sections and net rigging. Correctly rigged, the doors of the otter trawl keep the mouth of the net open by operating at an outward angle from the direction of the towed trawl. This angle varies between 30° and 40°.



Methods of lacing two parts of webbing are described. In addition, assembling an Iceland trawl net and bending the trawl net are also described. In the discussion on bending the trawl net, the author illustrates attaching the head rope, floats, attaching the foot rope, belly lines, door ends, quarter ropes, footrope rollers, the splitting strap, and the cod-end rope.

Three tables are included giving specifications of cotton, manila, and synthetic twines.

Free copies of FL 437 may be obtained from the Division of Information, U. S. Fish and Wildlife Service, Washington 25, D. C.